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THE RELATIONSHIP OF ANTHROPOMETRIC MEASUREMENTS
TO VOLLEYBALL ABILITY IN HIGHLY SKILLED FEMALES

by



SUSAN JENNIFER SEABORN

A THESIS

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The undersigned certify that they have read, and recommend to the
Faculty of Graduate Studies and Research for acceptance, a thesis
entitled THE RELATIONSHIP OF ANTHROPOMETRIC MEASURES TO VOLLEYBALL
ABILITY IN HIGHLY SKILLED FEMALES

Submitted by SUSAN JENNIFER SEABORN

in partial fulfillment of the requirements for the degree of MASTER OF
ARTS

ABSTRACT

The purpose of this study was to determine the relationship between anthropometric measurements, fitness and volleyball ability.

Forty-one highly skilled female volleyball players were subjected to various fitness tests, power tests, and two volleyball skill tests. Each subject was also measured to determine approximately sixty-five body measurements including several girths, lengths, and diameters. Anthropometric ratios were also analyzed.

The subjects were divided into two groups. Group 1 included the more highly skilled players and Group 2 was categorized as the less skilled players.

The data was analyzed using a computer. Individual descriptive statistics were compiled, which included the means of all variables, the maximum and minimum scores and standard deviations. Also included in the analysis were t-test scores of the means for Group 1 and Group 2; on all variables. The interrelationship of all variables was determined.

The following were the main results of this study: (1) the more highly skilled volleyball players were found to be generally bigger and heavier, (2) the more highly skilled players generally had significantly larger length, girth and diameter measurements.

1) The following anthropometric variables appeared to be the best indicators of volleyball success: chest diameter, arm span, wrist diameter height/weight ratio, forearm girth, shoulder diameter, trunk length ankle diameter abdominal girth, ankle girth, knee diameter, chest girth, stand and reach.

2) The following fitness and skill variables appeared to the best indicators of volleyball success: spike jump, block jump, three successive broad jumps, level, volley test, vertical jump, athletic ability, experience and an shuttle run. (3) most of the subjects were taller and heavier than the normal populations and other volleyball subjects that were studied in past research, (4) the more skilled and less skilled players all were average compared to most of the anthropometric measures of international players, (5) the more skilled players were average compared to fitness scores of international players, and the less skilled group was below average on the international fitness scores. Based on these results it was recommended that volleyball coaches consider the following factors to aid in selecting their volleyball teams: body diameters, (shoulder, chest, wrist, ankle), jumps (spike, block, 3 successive broad jumps), body girths (forearm, abdominal, ankle, chest), arm span, volley tests, shuttle run, height/weight ratio, trunk length and stand and reach.

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CHAPTER I

INTRODUCTION AND PROBLEM

INTRODUCTION

Every year, coaches are concerned with the complexities of team selection, a very difficult task that is dependent upon many influencing factors. The skill that a player demonstrates may be affected by physical and/or emotional factors. The size, anthropometric measurements, as well as the physical fitness and training levels of an individual may affect skill achievement. Game sense, experience, attitude towards practices and games, self-image, confidence level and personality all play a part in determining the ability of a player.

One of the difficulties in selecting players for a team during the try-out camp, is that athletes may not show their true abilities. They are sometimes too nervous to perform to their potential, or they perform beyond their normal range of capabilities. In either case, it is this deviance from the normal ability levels that makes player selection so difficult for a coach. Many times, a coach will have to guess when estimating a particular player's personality or determination.

Volleyball skill performance is affected by a number of factors; experience, skill, psychological factors such as attitude, personality and determination, body type, structure, and fitness.

With the exclusion of past experience, most of the above factors are not easily measured by a coach. For example, a coach often will not be able to evaluate a player's personality until midseason, after many personal encounters and game and practice sessions. Personality characteristics are factors that cannot be easily assessed early in the year. Player's physical characteristics and fitness levels, however, are measurable and these measures are available to every coach.

A coach's job of selecting the potentially-best group of players is a difficult task. If at least one or two of these factors affecting performance are testable, then a coach can partially select players according to some reliable measure of their attributes.

Through studies such as this one, a series of valid and reliable selecting tools will eventually become available to coaches.

STATEMENT OF THE PROBLEM

The purpose of the study was to determine the relationship between skill performance in volleyball and physical characteristics such as body structure and fitness.

Three questions were identified to guide the research. The first question was to determine the extent to which highly skilled Canadian players resembled other volleyball players in structure and fitness. Comparison was made to international players as well as to subjects

from earlier studies.

The second problem was to determine which of numerous structural, fitness and skill factors differentiated between those highly skilled Canadian female volleyball players who achieved national level of play and those who did not. Identification of these factors provides variables for selection criteria for highly-skilled teams.

As a result of the analysis of this question, performance factors were identified as variables which differentiated the national level players from the others. Since these variables are those that are highly skill-loaded and therefore dependent upon instruction and experience they do not serve well as selection criteria for new players who may be unskilled. The purpose of the third question, therefore, was to identify the structure and fitness variables that related highly, to those performance variables with a view to establishing selection criteria for less-skilled players.

HYPOTHESIS

The study tested the following null hypothesis: There was no significant difference between fitness and skill test scores between Canadian National level volleyball players (x_1) and Canadian National level volleyball players (x_2). The .05 level of significance was used throughout this study to test the hypothesis.

$$H_0: \bar{x}_1 = \bar{x}_2$$

DELIMITATIONS

1. The test sample was limited to forty-one skilled female volleyball players from Manitoba, Alberta, and Ontario.
2. Physical fitness was measured by a spike, a block, a three successive broad jumps test, a grip strength test, a sit and reach flexibility test, an agility run, and a push-up test. Volleyball skill was measured by the Brady wall volley test and the AAHPER service test. Skill was also assessed through questions about each player's experience, level, position, frequency of playing and volleyball and general athletic ability.

LIMITATIONS

1. The location of the testing was altered for the subjects, so there were differences in floor surfaces, lighting, and other aspects of the testing situation.
2. The tests were administered in the off-season, so that athletes were at different stages of their training or de-training.
3. The skill tests chosen may measure performance in a drill situation rather than a game situation.
4. Only 13 subjects were included in the sample of national calibre players. Because of this, those skilled players not on National teams were included to answer the sub-problems.

DEFINITION OF TERMS

Junior level volleyball players - those players under twenty years of age.

Juvenile level volleyball players - those players under eighteen years of age.

"AA" level volleyball player - those players involved in the top skill level of teams in city leagues.

"A" level volleyball player - those players involved in the level below the "AA" teams.

Three successive broad jumps - a two footed jump executed three times in succession from a standing start.

Muscular endurance - the ability to execute repeated performances of a physical task.

Physical fitness - in this test referred to items tested that related to fitness for volleyball, for example, spike, block, three successive broad jumps, grip strength, push ups, agility run and sit and reach flexibility test.

CHAPTER II

REVIEW OF LITERATURE

STUDIES IN RELATED SPORTS ACTIVITIES

Studies on Body Structure Using Anthropometric Measures

Studies of the body's shape and size have existed for many years. The earliest beginnings were with the Greeks and Romans who identified and recreated the "perfect athletic bodies" through their artwork and sculpture (Clarke, 1976). Since then, many researchers have compared body proportions of the average man and woman to the superior athlete, to determine whether or not specific body structures were related to success in different sports. Some of these studies have looked at the structural differences between athletes and non-athletes, while others have tried to capture the characteristics of athletes in specific events. In the latter case, attention has been focused on gymnastics, track and field, basketball and volleyball.

Several researchers have studied the anthropometric measures of gymnasts. Sinning & Lindberg (1972) studied the physical characteristics of fourteen college age female gymnasts, comparing their height, weight, body density and other anthropometric measurements to other women and other gymnasts. Results showed the subjects when compared to other college women, were higher in body density, shorter, lighter in weight, and smaller in most skeletal measurements. The researcher suggested a gymnast's build would be compact, and muscular

with a slightly larger upper body compared to lower body. Larson (1974) at a later date described gymnasts as having short legs and well-developed chests.

Another of Sinning's studies (1978) showed that forty-four skilled female gymnasts, over a five year period, were found to be shorter, lighter, lower in body fat percentage, smaller skeletally, and smaller in most body circumference measurements. Gerber (1974) suggested that a gymnast's build facilitated short, quick rotary movements that are required in the sport.

Track athletes have been researched quite extensively and have been found to be taller than the general population (Malina, 1971; Gerber, 1974). Many researchers have claimed that the different athletes within track and field are categorized by specific anthropometric measurements (Cureton, 1971, Malina, 1971, Wartenweiler, 1974, Plowman, 1974, Gerber, 1974). Athletes in track and field have usually been categorized as throwers, sprinters, jumpers and distance runners.

Sprinters have often been reported as being short-legged, muscular (Malina, 1971), as having a high leg/trunk length ratio and high foreleg length/thigh leg length ratio (Cureton, 1951).

Jumpers have been characterized as long legged, linear and muscular (Malina, 1971, Wartenweiler, 1974) and tall (Cureton, 1951; Gerber, 1974). One researcher reported that good jumpers and agile athletes have wide shoulders compared to hips (Cureton, 1951), and have high Crural Indexes (foreleg length/thigh) x 100). Wartenweiler (1974) reviewed Tanner's (1964) and Correntis' (1964) studies that

described good track athletes. Jumpers were reported as having the following high ratios: leg length/height, height/hip width, height/knee width, height/arm girth, height/thigh girth.

Throwers have been measured, and were characterized by tall, broad, heavy bodies, high percentages of body fat, and large amounts of lean body weight (DiGiovanna, 1943; Cureton, 1951; Malina, 1971; Gerber, 1974; Wartenweiler, 1974; Ward, 1978). Other studies have shown the throwers to have longer arms, and higher upper arm length/forearm length ratios (DiGiovanna, 1943; Cureton, 1951; Gerber, 1974). Wartenweiler (1974) reviewed Tanner & Correnti, and throwers were reported as having long trunks, broad shoulders, wide hips, wide knee widths, large upper arm girths, high thigh circumference, high arm length/height ratios, higher shoulder width/height ratio, large knee width/height ratio, large upper arm circumference/height ratio, and greater thigh girth/ height ratio.

Ward and Disch (1978) studied forty-one female track and field athletes by administering fitness and anthropometric tests and found the following characteristics for each type of athlete: a) throwers were highest in weight, lean body weight, fat percentage, skinfold measures, and jump; b) jumpers even though they placed second to the throwers in vertical jump, had the lowest sums of skinfold, and had the highest velocity in the 5-10 yard and 35-40 yard speed tests; c) the distance runners weighed less, had a lower percentage of body fat and less lean body weight. They were reported as having the lowest vertical jump and lowest velocity in the 5-10 yard speed test. Other

investigators have reported that distance runners have narrow shoulders and small, thin builds (Malina, 1971; Gerber, 1974; Wartenweiler, 1974).

Some researchers have studied the anthropometric measurements of athletes compared to non-athletes. Cureton (1951) found athletes as a group were classified as different somatotypes than the rest of the general population. Some studies showed that basketball and volleyball players were heavier and taller than the average (Conger and Macnab, 1967; Carter, 1970; McArdle, 1971), while another study with very small sample size, showed no difference in size between the average person and the basketball and volleyball player (Medved 1968). Many researchers found gymnasts to be lighter and shorter than the average person (Pool et al., 1969; Sprynarova & Parizkova, 1969; Carter, 1970). Other researchers have reported that swimmers were of average height but somewhat heavier (Sprynarova and Parizkova, 1969) and swimmers between the ages of twelve to sixteen years were taller than non-athletes of the same age (Astrand 1964). Irata and Kadus (1971) as cited by Gerber et al. (1974) found no difference in pelvic measurements between athletes and non-athletes.

Medved (1966) studied the differences in height for sports people and non-sports people. After testing over six thousand, eight hundred male and female athletes, and approximately the same number of non-athletes, the following observations were recorded: the male basketball players, oarsmen, volleyball players and swimmers were taller while the wrestlers were shorter. The female athletes on the other

hand showed little difference from the average non-athlete, except that the track and field athletes, rowers and table tennis players were a little taller, while the gymnasts were a little shorter.

Pilardiew, Toublin, Valeri & Engel (1978) were reported to have studied 3758 male and female athletes between the ages of twelve to twenty years. They found wrestlers were shorter than the general population and judo athletes shorter only until sixteen years of age, when their heights approached the norm. They also found handball and volleyball players taller, and basketball players and boxers taller. After eighteen years the basketball players remained taller, while the boxers were only taller until twelve years, then were only average in height.

Conger and Macnab (1967) compared forty intercollegiate athletes to forty non-participant college students and found athletes to be taller, heavier, and to have a greater lean body mass, more kilograms of body fat, greater strength, greater maximum oxygen uptake, lower fat percentage in the thigh and lower steady state and resting heart rates.

Clarke (1961) studied the structure maturation, strength and motor ability of elementary and junior high school male athletes and non-athletes. The boys were classified as athletes or non-athletes by coaches and then subjected to several anthropometric fitness and motor ability tests. The following results were reported: a) the athletes had a higher skeletal age; b) athletes were significantly larger than non-participants, particularly in height, weight and lung capacity.

At the junior high level, arm, calf and chest girths were also larger in the athletes; c) more mesomorphs were found in the junior high athletes; d) strength measurements and standing broad jump scores were also higher for the athletes.

Several researchers have studied male and female athletes, particularly in the areas of anthropometrics and athletic ability. Carter, as cited by Gerber (1974) found females to have longer trunks, shorter legs, and lower centres of gravity than males. Martiny (1972) reviewed several researcher's findings. Martiny calculated the average height of women to be one hundred sixty centimeters and the average weight to be fifty-two kilograms. In addition Martiny reported that Bach calculated the following body proportions for women: upper limb length/height = 40 percent; lower limb length/height = 52.9 percent; trunk length/height = 52.9 percent.

Martiny also reported that Bischoff and Liebig had calculated the relationship between fat and muscle in males and females. They found that in women, muscle/total weight was 39 percent and that women averaged 28 percent body fat. Garn (1957) found the average fat percentage for women to be approximately 23.7 percent.

Plowman (1974) reviewed literature on champion female athletes, champion male athletes and female "school" athletes. It was revealed that champion female athletes were more mesomorphic, leaner and stronger than the less athletic females. Also the champion female athletes possessed a higher aerobic capacity and could tolerate higher levels of lactic acid than the female "school athletes."

THE IMPORTANCE OF FITNESS TO SKILL PERFORMANCE

Body structure has been shown in previous sections of this review to be directly related to performance in sports skills. One of the other factors that discriminates between successful and unsuccessful performers is physical fitness. Relationships appear to exist between body structure and physical fitness, with both factors relating to skill performance. Fitness studies have focused on flexibility, speed, strength, endurance, agility and power.

Leighton (1960) found flexibility to vary with different sports, and that too much flexibility in certain sports may be detrimental to success. After testing college women, McCue (1953) found that women who had a history of being physically active tended to be more flexible. Clarke (1976) reviewed Odger's test that found flexibility to be associated with sport success. Boys aged six to thirteen years were tested for flexibility and fitness. The boys that were more skilled in the broad jump, thirty yard dash, and softball throw had greater extension and flexion in the trunk region.

Oyster & Wooten (1971) tested one hundred, and seven college women on the speed of the last thirty-five yards of a fifty yard dash and eighteen selected anthropometric measures. The most significant correlations between speed and anthropometric measurements were

weight, leg girth, and bi-trochanteric measures. These were negatively related to ability to perform the thirty-five yard dash. It was stated that probably no single anthropometric variable was predictive of thirty-five yard dash performance.

Hebbelinck (1963) measured fifty-two male college physical education majors between the ages of eighteen and twenty-five years. Selected anthropometric measurements were recorded and these were correlated with the scores of each of six fitness tests and total fitness. Most of the correlations between the anthropometric measures and fitness were not of high significance except between shot put ability and weight, shoulder width and neck girth. The test results also showed the mesomorphic types had the best fitness scores.

Clarke (1957) tested fifty-three college students and tried to correlate various anthropometric measurements of trunk and legs with sixteen strength measurements, endurance, agility and power measurements. Most of the measurements were correlated with each other as well as with the fitness and strength tests. Body weight and hip measurement were the two factors correlated with all the other measurements.

Espenschade (1963) tested the relationship between age, height, and weight with results on the California Physical Performance Test. Over seven thousand boys and girls between the ages of ten to eighteen years were tested on broad jump, fifty yard dash, distance throw, knee push-ups (for girls), pull-ups (for boys) and sit-ups. The results indicated that age was the most significant factor and that height and

weight factors varied in significance according to age.

Burley (1961) studied one hundred grade seven, eight and nine girls in speed, flexibility, and power to see if there was any correlation between the three factors and selected anthropometric measurements. The results indicated that the anthropometric measurements had little effect on speed, power and flexibility.

Pierson (1961) categorized twenty-one untrained college students into the following shapes: a) short and heavy, b) tall and heavy, and c) tall and light. The subjects were measured for height, weight, sprint start speed, reaction time, lean body mass and percentage of body fat. The results indicated there were no correlations between any of the anthropometric measurements, speed and reaction times.

Thorsen (1964) tested the relationship between speed, strength index, jump, six hundred yard walk-run, back and leg strength, and forty-three different selected anthropometric measurements. Ninety-six freshmen women were photographed and measured for various body depths, lengths, breadths, areas and shapes. The subjects were then tested for speed, muscular power, cardio-respiratory endurance and strength. Some of the results were as follows:

- a) length measures were correlated with strength;
- b) the ratio of upper leg length/lower leg length was important in speed, jump, six hundred yard walk-run, and strength index;
- c) the ratio of upper trunk length/lower trunk length was more important to speed, power and six hundred yard walk-run than individual trunk measurements;

- d) height was more highly correlated to strength measures than power or speed measures;
- e) most of the depth and breadth measurements were related to the strength tests;
- f) the dorsal upper trunk area was related to strength measures;
- g) all lower trunk area measures were related to the jump;
- h) the build and shape index were correlated with all the fitness tests except the back lift;
- i) body weight was correlated with strength;
- j) some measurements were combined into formulas which seemed to be more related to performance than individual measurements.

Related literature appeared to reveal many different relationships between anthropometrics, fitness and skill. Obviously more research in these areas is needed to determine the relative contribution of each factor to performance in a wide variety of sport situations.

Anthropometrics Measures and Sport Skill Success

Some studies have focused on the relationship of anthropometric measures to individual and team success (Gladden, 1974; Alexander, 1976; Morrow et al. 1979) in an attempt to identify the factors that differentiate winners and losers in competitive events.

A study by Khosla (1971) showed that Olympic medal winners were taller and heavier than Olympic non-medal winners. Olympic non-medal winners were in turn heavier and taller than the average population.

Khosla also found that the Olympic winners participating in different weight classes tended to be at the heavier end of their classes.

In testing subjects on an agility run, Sills (1953) found mesomorphs performed better in the agility tests. A year earlier Bookwalter (1952) found thinner boys performed the agility run faster than boys with medium physiques.

Clarke (1976) stated that "weight within limits was an advantage in making and being successful on interscholastic athletic teams at all school levels (page 46)."

DiGiovanna (1943) tested 836 college men, and studied their anthropometric, strength and power measurements. The purpose of the study was to identify which measurements, if any, were necessary to be successful in baseball, basketball, football, gymnastics, tennis, track and field. Also tested were a one-sport group, two-sport group, three-sport group, total athletic group and non-athletic group.

Most results indicated that athletic groups were stronger and more powerful. It was also concluded that strength, power, and certain body builds are associated with athletic success and that the requirements of each sport would determine the type of build that would be necessary for success in that sport.

Bowne (1960) filmed forty-two high school girls, executing underhand and overhand throws. Measurements were taken of the length of their trunks, arms, and hands. These measurements were compared to each subject's ball throw velocity. The length variables did not appear to make a notable difference in throwing velocity.

Krakower (1941) measured the weight, height, leg length, foot breadth and hip girth of 561 non-track college men, and sixteen college high jumpers, all of whom had jumped over six feet. In this study it was reported that the better jumpers within the non-track group, were often taller, had longer legs, and broader feet. The poor jumpers within the non-track group were characterized by large weight measurements and larger hips. When compared to the non track group the track group was found to have greater height, longer legs and broader feet.

Two studies reviewed basketball players' measurements and their correlation with success. Beall (1939) showed the better female basketball players to have longer arms, longer feet and wider shoulders.

In a more recent study, Alexander (1976) ranked and charted the play of fifty-three skilled female basketball players participating in the 1974 Canadian Intercollegiate Basketball Championship. Several anthropometric measurements were taken of all the players. The relationships between these measurements and the players' game performances were evaluated. It was found that the top ten players demonstrated greater humerus diameter, weight and biceps and calf girths. Furthermore, height was positively correlated with good playing ability and proved to be a good indicator of basketball performance, points scored, and number of rebounds retrieved. The highly skilled basketball players were also generally taller and heavier than the average female population.

It can be concluded from these studies that body structures can facilitate team success and furthermore that success in specific motor skills (for example throwing and sprinting) can be attributed to some degree to favorable physical characteristics.

STUDIES ON VOLLEYBALL

Anthropometric Studies of Volleyball Players

Relatively few studies have focused on the anthropometric measures of volleyball players. Of those that have, the study recently published by the Canadian Volleyball Association (1978) contains the most extensive data.

Approximately thirty-seven anthropometric measurements from twenty-four men's and women's national volleyball teams were recorded from the 1977 'World Cup Volleyball Championships. The Cuban, Hungarian, Bulgarian, Russian, Japanese, American, Korean, Chinese and Canadian teams were included in the sampling. Standard deviations and means were developed for each team on which measures were taken. Those measures of specific interest to the present study were reported in Table I.

Hosler, Morrow and Jackson published an article in the Canadian Volleyball Association's Technical Journal (1979) which outlined their study on volleyball players. They tested eighty female collegiate players in the 1977 University of Houston Invitational volleyball tournament to determine anthropometric scores for highly skilled

women volleyball players. Several anthropometric measurements were recorded, as well as ages, fat percentages, sprint times, and leg and arm strength measurements. The following are some measurements that were recorded:

- a) mean height was 169.72 centimeters
- b) mean weight was 65.06 kilograms
- c) mean shoulder diameter was 37.79 centimeters
- d) mean hip diameter was 28.2 centimeters
- e) mean fat percentage was 21.5.

It is possible that these values may differ for players who have specific positions. For example, Martiny (1972) suggested that setters are usually shorter than spikers and also that setters have stronger muscular builds.

Investigators that study the relationship of body structure to volleyball performance typically have looked at the characteristics of teams and individuals in attempts to identify the factors that contribute to skill and successive competition. Morrow et al. (1979) carried out a study on one hundred, eighty female collegiate volleyball players. The subjects were tested on strength, speed and six anthropometric measurements. These measurements were correlated with team success in a twenty team volleyball tournament. The results showed there was a significant difference between the top four teams and the bottom four teams, and that the difference was significantly related to body strength and body fat. The top four teams were stronger and carried less body fat.

Mohr and Haverstick (1956) tested one hundred and two college women on two types of volley tests, Scott's agility run, and a jump test. Correlations were done to find if any relationships existed between height, wall volley tests behind three foot and seven foot restraining lines, jump reach and agility. The results indicated there was a significant relationship between the volley tests, the jump reach, and the agility run. In addition, height seemed to be a factor only in the volley test when subjects used the three foot restraining line.

Gladden and Colacino (1979) tested eighty-eight females and ninety-four males in the 1974 United States Volleyball Championships. The authors tested anaerobic power using a modified Margaria test, vertical jump, height, and six skinfold measurements. The purpose of the study was to identify physical and physiological characteristics of national level volleyball players, and to determine if any relationship existed between these characteristics and success in a national tournament. The results indicated there was a significant correlation between the successful women's teams and age, height, stand and reach, vertical jump and maximum height attained by jump and reach.

Disch and Disch (1979) did a performance and anthropometric study on thirty-one male volleyball players with the Rice University Volleyball Club. Twenty-two players were junior varsity members while nine players were varsity team members. The players performed a battery of fitness tests and were measured for weight, height, stand and reach, and fat percentage. Based on both the fitness tests and the measure-

ments, the players were categorized and grouped as either a prospective junior or senior player. Of all the players 93.5 percent were categorized in a way that corresponded directly to the level of skill. The test appeared to be accurate and useful in evaluating players.

Lamp (1954) tested eight hundred, six junior high school students. Volleyball skill tests were performed and age, heights, weights, and grip strengths were measured. Weight and age were positively correlated to skill with the females, while height was positively correlated to skill with the males when skill was measured by a volley test from behind a three foot restraining line. Strength was correlated to skill with both the male and females tested.

An abstract of a Polish study done by Lacka outlined anthropometric measurements that were done on sixty-three male and sixty-three female volleyball players who were members of the Polish National team, and members of the first, second and third league teams. A control group was also tested. This control group consisted of one hundred sixty-six males and one hundred twenty-two females, all in college. The superior athletes were recorded as having higher measurements except for body fat. Members on the National team and those playing in the first and second leagues were reported to be twelve centimeters taller than the control group.

While these investigations have attempted to find statistical support for the factors that determine success in volleyball other authors have merely stated their feelings, knowledge and ideas on what physical qualities a volleyball player should actually possess.

Shondell and McManama (1971), for example, discussed the physical qualities needed by good volleyball players. They felt speed, strength and power, agility, balance, co-ordination, flexibility, finger dexterity, hand-leg co-ordination and receiving and hitting skills were all important to a good player. Furthermore, they stated that good height aids a player in blocking and spiking and that the shorter players are probably better suited to play back row defense. Slaymaker (1978) characterized the top players as those who were superior in vertical, jump, reaction time, grip strength, lateral agility and speed. The author also felt that height was the most important physical characteristic of a good volleyball player.

It is clear that both objective and subjective data on volleyball indicate that the best volleyball players are tall, strong, with low percentage of fat, and that they possess a wide range of skill-related characteristics.

VOLLEYBALL TESTS FOR SKILL AND FITNESS

Many researchers have attempted to develop various sports skills tests and/or fitness tests that would reliably and effectively evaluate and categorize athletes. Sports skill tests have been in existence since at least the early 1900's. Several authors have reviewed and discussed these tests (Krakower, 1937; Trotter, 1965; Collins, 1978; Rash, 1979). Volleyball skill tests have been quite numerous, except in the areas of defense, spiking, and blocking. Since these

skills have become increasingly important as the game has developed over the past ten years there is a clear need for extended research in identifying useful tests for evaluating volleyball performance.

Volley Tests

The wall volley tests in particular, are the most predominant ones in the literature. Most of the tests follow similar patterns of methods and procedures.

Most volley tests require the subject to volley against a wall (over certain heights marked by different lines), for a certain time period. In many tests the subject must stand behind a restraining line, whether it be three feet, six feet or seven feet. The various tests require certain time periods for the subject to volley, as well as a certain number of trials. Most tests require the subject to start the test by tossing the ball to the wall, and when it returns start to volley. Each volley is counted as one point if it is legally contacted, and the subject and ball stay within their legal boundaries.

French and Cooper (1937) devised a high school volley test that required the subjects to volley from behind a three foot restraining line, and over a seven and one half foot line on the wall. Ten trials of fifteen seconds each were allowed, with the sum of the best five trials counting as the actual test score. Combined with the serve test, this skills test was reported to correlate .81 with subject's skill as rated by volleyball coaches. The validity of most volleyball

skill tests were measured by subjective evaluation of the athletes by volleyball experts.

In the same time period, Bassett, Glassow and Locke (1937) tested college women using three thirty-second trials. The starting line was six feet from the wall and the ball was volleyed over a seven and one half foot line on the wall. After testing one hundred, ninety-five females, the reliability coefficient was .89 when the three trial scores were summed.

A 1937 Wisconsin volleyball test for college women was cited by Collins (1978). It required the subject to start volleying from behind a six foot restraining line. After the initial volley the ball contacted an area seven and one half feet upon the wall. The score consisted of the sum of 3 thirty-second trials.

Russell and Lange (1940) developed a junior high level test that required the subject to volley from behind a three foot restraining line, with the ball contacting the wall above a seven and one half foot line. The final score consisted of the best score out of three, thirty second trials.

Mohr and Haverstick (1955) examined a wall volley test with three foot, five foot and seven foot restraining lines on the floor. The subjects were to volley for thirty seconds above a seven and one half foot line on the wall. All trials were performed; the first trial was performed from behind the three foot line, the second trial was performed behind the five foot line and the third trial was performed behind the seven foot line. The subject's score was the sum of the

number of times the ball could be legally volleyed for all these trials. All the trials were reliable (.93, .94). Two trials attempted from behind the seven foot restraining line had a validity of .78.

Clifton (1962) tested forty-five college women in 1960. Subjects were tested first behind a five foot restraining line and then behind a seven foot restraining line. In that test each trial required volleying the ball for thirty seconds, over a line on the wall that was seven and one half feet high. The subject's score was the sum of the two trials. The coefficient for reliability was .83, and the score for validity when both trial scores were summed, was .70.

Liba and Stauff (1963) designed two volleyball tests, one for college women and the other for junior high girls. The tests were based on the ideal heights and horizontal distances of good volleyball passes. The subject, from a self-toss, would volley the ball between two ropes, placed above the net at the appropriate height, and would attempt to place the ball on the appropriate target on the other side. A score was assigned for proximity to the ropes, and proximity to the target. The rope score multiplied with the target scored yielded the total first score. The subject attempted ten trials. The reliability of this test was .82, and the validity was subjective evaluation of ability to volley a ball.

Kronquist & Brumbach (1968) modified the Brady Volley test to suit grade ten and eleven boys. Seventy-one subjects volleyed the ball for three, twenty second trials, over a line eleven feet above

the floor. There was no restraining line. The score was recorded as the sum of the best two scores out of three trials. The test estimated .767 on validity and .817 on reliability.

Cunningham and Garrison (1968) tested one hundred, eleven college women and devised a test whereby the subject could stand anywhere and volley against the wall for two thirty second trials. The ball had to be volleyed over a line ten feet above the floor on the wall. The test score was the sum of the best two trials. This test had a validity coefficient of .72 and a reliability coefficient of .87.

The American Association for Health Physical Education and Recreation devised a volley test. This test was described by Shay (1969) and Collins (1978). The subject was required to volley over a line on the wall, that was eleven feet off the floor, was five feet long and had three foot lines extending vertically upward from each end. Each subject was allowed two sixty-second trials and the best score counted.

Trotter (1965) developed two types of volley tests, one using a court and the other using wall space. The court test involved the subject volleying for thirty seconds to himself, above the net height, in an area ten feet by ten feet by the net. The best of three trials was the score. The wall test was developed for the senior high and college level. This test involved three, one minute trials. The subject standing behind a three foot restraining line, attempted to volley the ball between or over two lines that were placed seven feet, four and one quarter inches and ten feet on the wall above the floor.

If the ball was volleyed between the seven and ten foot lines, the subject received one point. If the ball was volleyed over the ten foot line, the subject received two points. Only the consecutive legal volleys were counted, if the subject missed a volley, the count was restarted from zero.

Slaymaker (1976) outlined a volley test in which the subject had to volley, for thirty seconds, over a ten foot line marked on the wall, from behind a six foot restraining line. The sum of the three trials was the final score.

A few other researchers devised volley tests that deviate from the regular wall-type format. Sandefur (1970) developed a setting test using a basketball hoop. Slaymaker (1976) used two nets to test a set-up. The subject was required to volley a ball over an eight foot net, and attempt to have it land inside two targets located just in front of the regular net.

The AAHPER tests as cited in Shay (1969) and Collins (1978) were similar to Slaymaker's test in that the subject attempted to volley a ball over eight foot high ropes, or ten foot high ropes (depending on the test) and land it on one of two specific targets close to the spiker's area.

Volleyball Serve Tests

Service tests have also been quite frequently examined. The serve test formats are usually quite similar. Most require the

subject to serve the ball over the net a certain number of times into specific target zones, worth a certain number of points.

The Russell-Lange test (1940) required the subject to serve ten times, and for two trials. This serve test had a .68 validity coefficient and a .92 reliability coefficient.

The Brumach serve test, as outlined in Collins (1978) was designed for college men. Each subject attempted to serve the ball between a rope and the net. The rope was suspended four feet above the net. The court was zoned into three areas, one area along the back line (two feet inside the court), another area along the back line (two feet outside the line) and the rest of the court. Each area had two different point values allotted to it. A ball served over the rope, into an area, received the lower value, a ball served between the rope and net, received the higher point value, a ball hitting the rope, was reserved. The subject served two trials, with six attempts per trial. The score was recorded as the sum of the best ten attempts.

Collins (1978) described two more serve tests. The Wisconsin serve test required the subject to serve fifteen times, under a wire, over the net, at a concentric set of squares placed in the back left hand corner. Points were allotted for hitting the different sized areas. Points were allotted for hitting the different sized squares, for serving the ball between the wire and net, and even for serving the ball out of court, but over the net. This test had a validity coefficient of .79 and a reliability coefficient of .84.

The Petry volleyball serve test was developed in 1967, for high school girls. The width of the court was divided into six foot sections. Another six foot section was marked off behind and along the back line. The higher points were allotted to the serves that landed near the end line. Double points were awarded if the subject also served between the net and the rope (suspended three feet above the net). The reliability for this test was estimated as .82 if thirty serves were attempted.

Slaymaker (1976) developed a very simple test with only two lines marked on the court. The lines divided the court lengthwise, and were marked at twenty feet from the side line, and twenty-six feet from the endline. The area inside the twenty-six foot line was worth one point, the next area five points, and the area along the right sideline was worth ten points. Each subject was allowed ten trials.

Sandefur's serve test (1970) required the subject to serve ten times, between a rope and the net. The court was marked off into five areas, four areas along each boundary line, and the middle area. The total score was the sum of the ten individual serve scores.

Trotter (1965) reviewed three serve tests that were quite similar. The French-Cooper serve test allowed the subject to attempt ten serves, into seven different areas, and five different point zones. The subject's score was the sum of the ten individual serve points.

The Trotter serve test only had four areas on the court marked off; those being along the side lines, the back lines and the middle

court. Again ten serves were allowed, and the total test score was the sum of the ten individual scores.

The Odeneal test, had identical floor markings as the Trotter test, except that each of the areas was worth a different number of points. The procedure was also the same.

Other Types of Volleyball Tests

Other volleyball tests have been developed, but with relatively little success, since the other skills usually require some subjectivity or other variables which are difficult to measure objectively.

Sandefur (1970) developed a bump test that was a similar type of test as the Brady Volley test, except the subject was required to bump the ball over an eight foot high line on the wall.

Slaymaker (1976) developed a similar test to Sandefur's test, except there was no wall marking. Slaymaker also developed a spike test, but it was found not to be reliable.

Fawcett (1978) briefly described the spiking tests developed by Laveaga and Blackman. Basically both of these tests were somewhat subjective in nature, and depended on the accuracy, speed and angle of the spike.

Fawcett (1978) also tried to establish the validity and reliability of a series of volleyball tests. Fifteen college females between the ages of nineteen and twenty-one participated in two

volley tests, a dig, a spike and a serve test. The players were all ranked in ability by three judges. Their abilities were then correlated with an equation of their ability. Each individual's equation was the sum of: the averaged volley score multiplied by three, the dig score multiplied by two, the spike score multiplied by one and one half, and the serve score.

After the testing and correlations had been completed, the Garrison and Cunningham volley test and Singer's spike test appeared to be the most valid and reliable tests. Fawcett concluded that individual skill tests were not good indicators of game situation ability. Equations composed of various tests may offer a better solution to individual skill tests.

Jackson (1967) attempted to develop a rating scale that would evaluate volleyball players in a game situation. The scale was used in forty-eight women's games by judges who attempted to evaluate each of the players on eight important volleyball game skills. The best validity of the scale was .470, the reliability .495 and the objectivity was .875. The test was considered to have good face validity and also was useful as a coaches' evaluation tool.

Cox (1974) investigated the relationship between team performance and the skills of serve, serve receive, setting, spiking, spike defense, and free ball passing. Over one hundred games were charted and evaluated. The results showed that the volleyball skills were related to overall game performance, and were important in the following order: spike, spike defense, serve reception, setting,

serving and free ball passing.

Fitness Tests for Volleyball

Assessment of potential volleyball talent is not only achieved through skill tests, but also through fitness testing. Many fitness components are necessary before a player can compete seriously in a high level game. Several authors have tried to establish a set of physical fitness tests that correlate highly with the game.

Shondell (1971) found a reliable and valid battery of fitness tests that correlated highly with volleyball ability. The test consisted of a medicine ball throw, thirty yard dash, wall catch, zig-zag run, jump and reach and weight measurement.

Jackson et al. (1974) was able to discriminate between regional and national level players by subjecting these players to a battery of tests that included vertical jump, three successive broad jumps, agility run, twenty yard dash, basketball throw, and Queens Step test.

Later, Disch, Field and Liskevych (1976) studied Jackson's battery of tests to establish the reliabilities of each one. All of the tests were reliable, and based on subjective evaluation and the above tests, eighty-six percent of Jackson's subjects were classified correctly.

Fleishman (1964) tested hundreds of men in the Navy, and found pull-ups or push-ups to be good dynamic strength indicators, hand grip to be a good static strength indicator, the shuttle run and fifty yard

dash to be a good test for the legs, softball throw to be a good test for arm and shoulder use, and the leg lift to be the best test for trunk strength.

Broer (1958) tested the reliability of two motor ability tests and eight sports skills tests on junior high school girls. The battery included two volleyball, three basketball and three softball skill tests. The author tried to determine the number of trials that would be necessary for the tests to become reliable.

Holland (1968) tested one hundred, forty-seven women on flexibility and her results indicated that there were no real true single tests for flexibility. A year later, Harris (1969), felt that flexibility was not a general characteristic of the average subject.

Several tests have been carried out to try to establish the validity of skinfold tests. Clark, Geser, Hundson (1956) obtained a .79 correlation between the caliper measurement of fat over the biceps and an X-ray measurement. Garn and Gorman (1956) found x-ray measurements and caliper measurements to be .88 correlated. In the same year Mayer (1956) found the triceps fat measurement to be the most accurate indicator of over-all body fat.

Many researchers have tested specific groups of people to establish norms for fitness.

Rea (1980) used the jump and reach, trunk flexibility and sit-up tests to measure fitness of volleyball players at camp. All-stars were those players who scored eighteen inches to twenty-five inches on the jump test, twenty-three inches to twenty-eight inches on the

flexibility test, and fifty to sixty repetitions on the sit-up test.

Albright and Boone (1977) did fitness testing on ninety-two women between the ages of fifteen and seventy-three years old. Two groups were arranged to test; one group included those subjects under thirty-three years of age, and the other group included subjects thirty-three and over. Some averages were established on heart rate, maximum oxygen uptake, fat percentage, sit-ups, hand grip, and trunk flexing. The women averaged twenty-nine sit-ups per minute, 22.8 percent body fat, twenty-six kilograms of strength on the hand grip test, and nineteen and one-half inches on the flexibility test. For these tests the authors calculated that a woman in excellent physical condition could exceed forty-six sit-ups per minute, thirty-six kilograms on grip strength, exceed twenty-six and one half inches in flexibility and carry less than 18.7 percent of body fat.

Johnson and Nelson (1979) outlined many different tests for each of the fitness parameters. Most of these tests have been used by many coaches to evaluate volleyball potential.

Perhaps the most recent and extensive set of volleyball fitness tests and scores, are those published by the Canadian Volleyball Association and the Japanese Volleyball Association.

The Canadian Volleyball Association has developed a series of tests and equations called the Volleyball Index. It is discussed fully in the Canadian Volleyball Association Bulletin (Sawula 1979). This index is an equation of a player's potential based on age, height, block jump, spike jump, line touch test, front flexibility,

sit-up test, three successive broad jumps distance and twenty meter sprint. These tests, along with a subjective evaluation of skills, provide the basis of the C.V.A.'s National Team Try-Out Evaluation Sheet.

Many fitness tests and evaluations have been performed by the Japanese. Toyoda (1974) listed the physical performances of National Volleyball players in the 1977 World Cup. Again many of the same types of tests were used. The battery of tests included: weight, height, grip strength, back strength, push-ups, three successive broad jumps, vertical jump, sit-ups, nine meter x three shuttle run, twenty meter dash, rolling testing, Harvard step test, forward bend, back bend and vital capacity. Other tests included by the Japanese have been chest girths, basketball throw, sidestepping, handstanding, maximum oxygen uptake, and reaction time.

CHAPTER III

METHODS AND PROCEDURES

SUBJECTS

The subjects in this study were highly skilled volleyball players who played in the top city leagues or who were members of provincial or national teams. The subjects ranged in age from sixteen to twenty-eight years. Forty-one females were tested.

The sample included some Senior and Junior National team members and players from the University, junior, juvenile, "A" and "AA" level clubs.

The subjects were volunteers who agreed to take part in the study. Since the testing was done in the summer months, only the Senior and Junior National players were in training. Therefore, the levels of experience, training and fitness varied among subjects.

TESTING PROCEDURES

Each subject was tested individually by the investigator. Data was collected through a number of tests. Each testing period lasted one hour.

The testing took place during the summer and fall of 1979, and the locations for testing included various gymnasias throughout Alberta, Ontario and Manitoba.

Four basic types of testing were administered to the subjects. They included anthropometric measurements, fitness and power measure-

ments, volleyball skill measurements and volleyball related questions and self-evaluation measurements. All results were recorded immediately on each subject's personal measurement sheet (see Appendix A).

The subjects were instructed to wear volleyball shorts, a light, short-sleeved T-shirt, socks and running shoes. Once the subject arrived at the testing site, the testing procedure was closely followed each time. The anthropometric measurements were taken first, then the subject warmed up lightly. The warmup usually consisted of three or four laps of the gymnasium, followed by some stretching, jumping and sprinting. Each warmup was done on an individual basis. Once warmed up the subject's fitness and power measurements were recorded. Following the fitness testing the volleyball skills testing was done. After all other tests were completed, the subject filled out a brief questionnaire on the back of her "Personal Measurement Sheet" (see Appendix A).

The anthropometric tests included age, weight, height, measurement of various body segment diameters, lengths, girths and skin folds.

The physical fitness tests included spike jump, push-ups, flexibility, shuttle run, block jump, grip strength, and three successive broad jumps. The fitness tests were administered in the exact order outlined above, so the athlete would not exhaust a specific group of muscles. The athlete would be able to exercise one group of muscles, then exercise a different group of muscles. The

subject was allowed rest time to recover between all tests so that the maximum performance could be achieved.

Volleyball skill was measured by using a repeated volleys test and serve test. The questionnaire at the end of the test period was directed at determining certain information about the athlete. The investigator asked the following questions:

- 1) How many years had the subject played?
- 2) What position had she played?
- 3) Had she always started for the team?
- 4) At what level had she played?
- 5) How would she rank herself as a volleyball player and an athlete?

The last phase of the procedure was to determine various anthropometric ratios and correlate these ratios with all other measurements.

MEASURING PROCEDURES

Anthropometric Testing

All subjects were measured using a Gulick tape to measure the girths, a sliding anthropometer to measure diameters and foot length, a metal measuring tape to measure lengths, and a Harpenden skin-fold caliper to measure skin folds. All measurements were taken on the subject's dominant leg, foot, arm and/or hand. The test-retest method of establishing reliability was used.

The following anthropometric measurements were recorded: weight,

age, standing height, arm span, arm length, foot length, lower arm length, longitudinal arch length, footwidth, stand and reach, calf girth, thigh girth, abdominal girth, bi-iliac girth, chest girth, biceps girth, forearm girth, ankle girth, shoulder diameter, chest diameter, bi-iliac diameter, knee diameter, ankle diameter, wrist diameter, biceps, triceps, sub-scapular and supra-iliac skin-folds.

The following calculations were recorded: sitting height, total leg length, upper leg length, total skinfold, percentage of body fat.

See Appendix B for detailed anthropometric measurement techniques.

Physical Fitness Testing for Volleyball

The fitness tests used in this study were common ones that many coaches around the world use frequently to test their players. The validity and reliability coefficients of these particular tests are not yet fully established. Throughout the testing no motivational techniques were employed to improve performance.

1. SPIKE JUMP - The subject approached the wall at a 45° angle, from the side of her dominant reaching hand. The subject wet her fingers so the height of her greatest reach could be recorded by a mark left on the wall chart. By using a two, three or four foot approach (normally used in a spike approach), the subject would jump close to the wall and reach as high as possible

up the chart. The subject was not allowed to climb up the wall. The height at which the subject could attain was measured from the point of contact of the highest reach to the floor. The subject was required to attempt two practice trials and three actual jumps. The three actual jumps were recorded. The highest reading out of the three trials, was recorded as the subject's score. It was this reading that the subject's stand and reach score was subtracted from, which resulted in the subject's actual vertical jump (with an approach). The mark at the top of the reach was recorded to the nearest centimeter.

2. SHUTTLE RUN - The shuttle run was an attempt to measure agility and mobility. The subject was required to stand behind one sideline of a volleyball court. On the command "Mark, Set Go," the subject ran as fast as possible to the other sideline, which she touched with her hand. She then sprinted back to the starting line. This pattern was repeated three more times, so that the subject sprinted the width of the volleyball court six times in total. In the last width the subject was allowed to sprint directly across the line. A stop watch was operated for this test. The watch was started as soon as the word "go" was uttered

and stopped as soon as the midline of the subject's body crossed the last side-line. The subject was not allowed any practice runs but was tested in two actual trials. After the first trial the subject was allowed to rest until she recovered adequately to run maximally again. The fastest time was recorded to the nearest half second.

3. PUSH UPS - This test was primarily directed towards testing the subject's muscular endurance. The subject was required to do as many full body length push ups as possible. The body had to begin the test in the "Down" position, with the feet against the wall. Each push up had to be in cadence with the original speed determined by the subject at the beginning of the test. The body had to be in a straight line, and lowered within six inches from the floor on each "down" phase. The subject started at will, and was deemed finished if no more push ups could be executed, (the original pace had been altered and the rate at which pushups originally were executed had been slowed down) or if the pushups were lacking in quality. The subject's score was determined by the number of pushups that could be performed in succession. There

were no practices allowed and only one actual test was performed. The maximum number of pushups the subject could execute was the score.

4. BLOCK JUMP - This test was also included to test leg power.

The subject was required to face, and stand a foot from the wall. No approach jump was allowed, only the arms could be used to propel the body vertically. The arms were not forcefully swung, they were raised quickly up by the subject's sides. The subject wet all her fingertips prior to the jump so the highest reach would show up on the wall as a wet mark on the centimeter chart. The subject jumped as high as possible and reached up the wall chart as high as possible. The highest jump was the score for the block jump. Two practice jumps were allowed, with three actual attempts to score. The subject's highest reach reading out of three attempts was recorded to the nearest centimeter.

5. FLEXIBILITY - The subject was required to sit on the floor,

straight legged with the bottom of her shoes lined up with a mark on the floor. The feet were approximately six inches apart and dorsi-flexed to 90°. The subject would place the tips of her longest fingers together, and slowly reach down the measuring tape. The

measuring tape was placed on the floor between the subject's feet. A designated zero mark on the tape was placed in line with the sole of the shoes. The measuring tape was numbered off in inches, so if the subject could touch her toes, she reached the mark zero; if the subject could reach two inches past her toes, she could reach the mark plus two inches, or if the subject was two inches short of reaching her toes, she could reach the mark minus two inches. While attempting to reach as far down the tape as possible, the subject was not allowed to ballistically stretch. Once the final point had been reached, the subject had to momentarily hold that position. Only one trial was allowed. It was assumed the subject had done some stretching in the previous warmup. The original reaches were recorded in inches, but these were converted to nearest centimeters for the analysis of results. Since the computer program could not take positive and negative numbers, four centimeters were added to each subject's flexibility reach. This enabled all subject's readings to be positive and all the flexibility readings remained relative. For example, if a subject reached $-.5$ inches, the entry into the computer was $-.5 \text{ inches} \times 2.54 = -1.27$ centimeters + 4 centimeters = + 2.73 centimeters. The

flexibility score was entered as 2.73.

6. THREE SUCCESSIVE BROAD JUMPS - This test was primarily to test leg power and co-ordination. There was an element of learning involved completing the item successfully. The subject started with her toes just behind a line. At her own time she was instructed to jump forward off two feet, three times in succession, from a standing position. The three jumps had to be continuous with no stopping in between. At the end of the three jumps, a mark was chalked on the floor where the heel of the closest foot to the starting line had landed. It was this distance from the starting line to the heel print of the closest foot that was recorded. The subject was given one practice and two actual trials. The two actual trials were both recorded by measuring each jump with a tape, and using the longest jump as the subject's final score. Each trial was measured to the nearest centimeter and the longest trial was recorded.

7. GRIP STRENGTH - The grip dynamometer was used in this test to determine the strength of the dominant hand. The subject gripped the dynamometer comfortably and was instructed to squeeze as hard as possible. The

subject, while standing, squeezed as hard as possible and the number of kilograms squeezed was recorded. Each subject was allowed two trials to squeeze the highest reading. The highest reading was the subject's actual score. The grip strength was measured to the nearest 1/10 kilogram.

Volleyball Skills Testing

1. BRADY REPEATED VOLLEYS TEST - The Brady Volley test was used in this study because the test could be administered relatively quickly and effectively. The Brady test had a validity coefficient of .86, and a reliability coefficient of .93. These two readings were higher than most of the other skill test measurements. Three pieces of visible tape were put up on the wall; piece "A" (five feet long) was placed horizontally and eleven feet, six inches off the floor. At each end of piece "A" another five foot piece of tape was placed vertically up the wall, so an open rectangular shape was formed. The player had to volley the ball into this area. The subject started the test by throwing a volleyball into the designated area. Once the ball rebounded off the wall, the subject started to volley it back into the rectangular area. Each volley into

the rectangle counted as one. The subjects attempted to volley into the rectangle (or extension of it between the vertical marks) as many times as possible within one minute. If the volleys were not legal, they were not counted; if the subjects lost control of the ball, they started the volleys again, as she did to begin the test, or if the volley did not contact the area within the marks, they were also not counted. A ball touching the line was considered no good. No practice trials were allowed, and two actual one minute trials were attempted. As soon as the subject first touched the ball to volley, after it had been thrown against the wall, the stop watch was started. A count was kept on how many legitimate volleys touched inside the designated area. Once sixty seconds elapsed, "STOP" was announced and the successful repeated volleys number was recorded. The highest of the two trials scores was the subject's final score.

2. AAHPER SERVICE TEST - A regulation volleyball court was marked off with tape as Figure 3 illustrates.

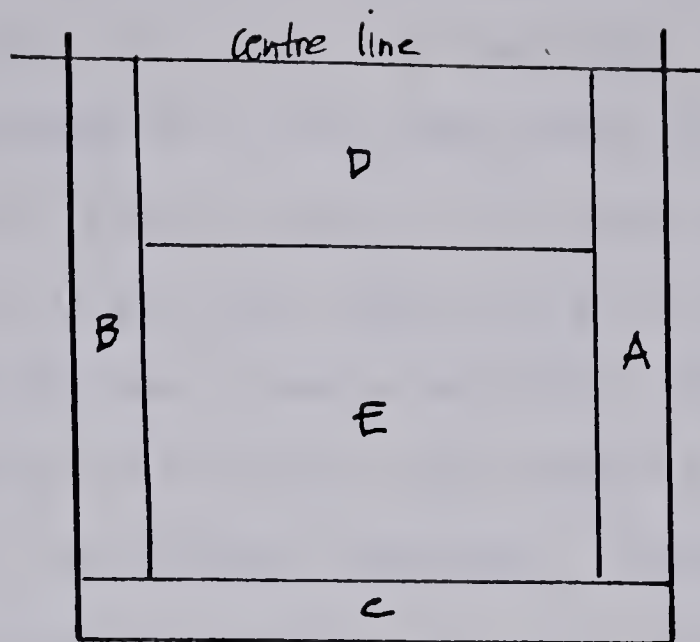


Figure 3 - Volleyball Court Markings

Section "A" encompassed the area from the centre line to five feet from the end line. The alley it formed was five feet wide. Section "B" was the same area as Section "A" except it covered the other side line. Section "C" covered the area five feet in from the entire end line. Section "D" included all the area inside sections A and B plus ten more feet back from the centre line. Section "E" included the remainder of the court. Each section measurement was taken to the middle of the marking tape. The subject was required to serve within the regulation service area, over a seven foot, 4 1/4 inch high net, into the marked area. Ten serves were allowed. The subject served ten volleyballs. If the ball went outside the aerals, landed outside the court, went into the net

or if the server footfaulted, the attempted serve was scored as a zero. If the server landed a ball in sections "A" or "B", three points were scored. If the ball landed in Section "C", four points were scored and if the ball landed in "D" or "E", one and two points were scored respectively. When a served ball landed on the line it was counted as the higher score of the sections concerned. The subject was not allowed to practice, but was allowed ten serves to score as high as possible. The score for each of the ten serves was recorded. Once the ten serves were completed, all of the ten individual service scores were totaled. The total was recorded as the subject's final score.

The AAHPER serve test was considered to have face validity. Norms were established for this test and also it was one of the easier tests to administer. The researcher also believed the court markings for this test were well divided and had good point allotment for the types of serves usually attempted in a volleyball game.

Self-Evaluation

Each player was requested to answer six questions on the back of the personal data sheet. The questions were asked to determine if

experience, athletic ability and confidence had any relationship to skill (See Appendix A).

The following questions were asked:

1. POSITION PLAYED - The players were asked to indicate which position they played most often in the testing year. Since the computer could only operate with actual numbers, the positions outlined below were numbered as follows:

The number 1 represented the right back player or serving specialist.

The number 2 represented the right front player, play set hitter, or blocking specialist.

The number 3 represented the centre front player, middle blocker or hitting specialist.

The number 4 represented the left front player, power hitter or hitting specialist.

The number 5 represented the left back player or defensive specialist.

The number 6 represented the centre back player or defensive specialist and number 7 represented the setter.

If the subjects indicated they most often played a particular position, the appropriate number was entered into the computer.

2. STARTER OR NOT - The question asked if the subjects were starters or not for their particular teams. The following categories were established for each subject, and a number was assigned to each category:
- The number 1 represented the subject that played 0-20% of the time.
- The number 2 represented the subject that played 20-40% of the time.
- The number 3 represented the subject that played 40-50% of the time.
- The number 4 represented the subject that played 60-80% of the time.
- The number 5 represented the subject that played 80-100% of the time.
- The score for each subject was the number that represented the amount of playing time they received during their last active year.
3. LEVEL PLAYED - The questions asked of the subjects were at, what level of play were they predominantly involved. Again each category was assigned a specific number to enter into the computer.
- The number 1 indicated the subject played mostly juvenile volleyball.

The number 2 indicated the subject played mostly senior high volleyball.

The number 3 indicated the subject played mostly "A" club volleyball.

The number 4 indicated the subject played mostly Junior volleyball.

The number 5 indicated the subject played mostly "AA" club volleyball.

The number 6 indicated the subject played mostly university volleyball.

The number 7 indicated the subject played mostly junior national volleyball.

The number 8 indicated the subject played mostly senior national volleyball.

Each subject received a specific category number which was entered into the computer as the raw score.

4. EXPERIENCE - The subjects were asked how many years they had actually been involved with volleyball. The answers that the subjects stated were recorded as their raw scores into the computer. For example, if a subject had played for ten years, the number ten was entered into the computer, if the subject had played for five years, the number five was entered.

5. SELF-RANKED VOLLEYBALL ABILITY - All subjects were asked how they would rank themselves on a scale of one to ten, for general volleyball ability. They were told to consider one as being very poor (lowest level) and ten as being superior (national calibre). They based their scale on the normal population of Canada. The score for each subject was entered as the raw score. For example if a subject answered 7.5 on a scale of 10, the number 7.5 was entered into the computer.

6. GENERAL ATHLETIC ABILITY - Again a scale of one to ten was used and each subject was asked to rank herself on general athletic ability (the ability to perform all sports actions well). One was ranked as very poor and ten was ranked as superior. The scores for the subjects were the numbers they selected out of ten.

Determination of Ratios

The scores for all subjects were compiled on Fortran Coding forms and entered into the computer. In addition to the measurements, ratios composed of body dimensions were also added into the computer for correlations calculation. The ratios were identified under the following code:

R1 represented upper arm length/lower arm length;

R2 represented shoulder diameter/chest diameter;
R3 represented shoulder diameter/bi-iliac diameter;
R4 represented calf girth/ankle girth;
R5 represented thigh girth/calf girth;
R6 represented biceps girth/forearm girth;
R7 represented height/arm length;
R8 represented arm span/height;
R9 represented height/leg length;
R10 represented height/trunk length;
R11 represented upper leg length/lower leg length;
R12 represented total leg length/trunk length;
R13 represented weight/height;
R14 represented biceps girth/forearm girth;

Determination of Top Players in the Sample

The superior players of the sample were determined by the following selection process. A player who was or had been participating at the Junior and/or Senior National team level or a player who was or had been participating at the professional level was categorized as a superior player or a Group 1 player. The rest of the players in the study were classified as Group 2 players. There were thirteen players in Group 1.

Analysis of Data

Sixty-six test scores, anthropometric measures, and body segment ratios were determined for forty-one female volleyball players. All information on each subject was entered into an Amdahl 470V/6 computer and analysed using the SPSS data analysis system.

Descriptive statistics for each of the variables were computed. These included the mean, standard deviation, standard error, range, maximum and minimum scores.

Correlation coefficients between all variables were also calculated. These calculations were included to determine the relationships between all the anthropometric measures, fitness, skill measures and ratios.

t-tests between the means of the top players and the rest of the sample were also calculated. This information was included to determine if any structure or ability differences existed between the superior players in the sample and the rest of the players.

CHAPTER IV

RESULTS AND DISCUSSION

COMPARISON OF RESULTS ON NATIONAL LEVEL PLAYERS TO RESULTS OF OTHER STUDIES

Other researchers or coaches have tested various groups of subjects and have established averages and means for their groups. Some averages for volleyball players are summarized in Table I.

Many coaches measure height, weight, body fat, and limb girths. The heights of players in Group 1 were generally greater than most players' heights from the 1977 World Cup Volleyball Championships. Group 1 subjects averaged approximately 10 centimeters taller than those subjects in Conger and Macnabs' (1967) study. The players in this study however were shorter than the Canadian Volleyball Association International Standards suggest they should be. Weight measures of Group 1 indicate they were heavier than most of the other international players. They were especially heavier than the volleyball players in Conger and Macnabs' study (1967).

It would appear that today's players are much taller and bigger than players in earlier years, and that coaches are selecting taller players for their teams. The average heights of international teams are gradually increasing. Canadians are one of the bigger teams in the World, especially when compared to the smaller teams from Korea.

TABLE I ANTHROPOMETRIC MEANS FOR SELECTED VOLLEYBALL GROUPS

Subject	Source	Year	Stand & Reach cm.	Shoulder Diameter cm.	Bi-Iliac Diameter cm.	Age yr.	Weight kg.	Height cm.	Right Forearm Girth cm.	Right Biceps Girth cm.	Fat %	Left Thigh Girth cm.	Left Calf Girth cm.	Sitting Height cm.
College women	Hosler	79		37.79	28.20	19.48	65.06	169.92			21.5			
Canadian women (stand)	C.V.A.	79				18 19 20		174 178 182						
International women (stand)	C.V.A.	79				20		182						
National Korean women	Toyoda	74				19.7	60.7	168.7						
National Chinese women	C.V.A.	78				21.9	65.3	174.9	24.6	26.6		54.7	36.4	92.19
Cuba National Women	C.V.A.	78				21.3	70.54	175.1	25.6	26.71		56.48	36.72	86.6
Hungarian National women	C.V.A.	78	224.82			23.6	66.56	174.96	24.59	27.48		53.17	36.08	91.68
Japanese National women	C.V.A.	78	217.83			23.3	67.7	172.5	24.6	27.0		57.0	38.5	91.7
U.S.A. National women	C.V.A.	78	231.7			22.8	66.7	177.3	24.2	26.5		55.5	37.0	91.1
U.S.S.R National women	C.V.A.	78				19.1	74.58	178.4	25.29	26.8		57.77	37.61	91.98
International Women (norms)	C.V.A.	78	217.3			22.1	67.6	172.2	25.0	27.1		57.0	38.1	91.1
College women	Conger Macnab	67					59.5	166			25.3			
Group 1	Seaborn	79	227.45	38.53	28.39	19.07	71.39	176.45	26.65	30.13	24.14	60.35	36.96	94.13
Group 2	Seaborn	79	219.64	36.74	27.95	20.00	64.23	172.55	25.74	29.08	24.25	58.13	36.04	90.07

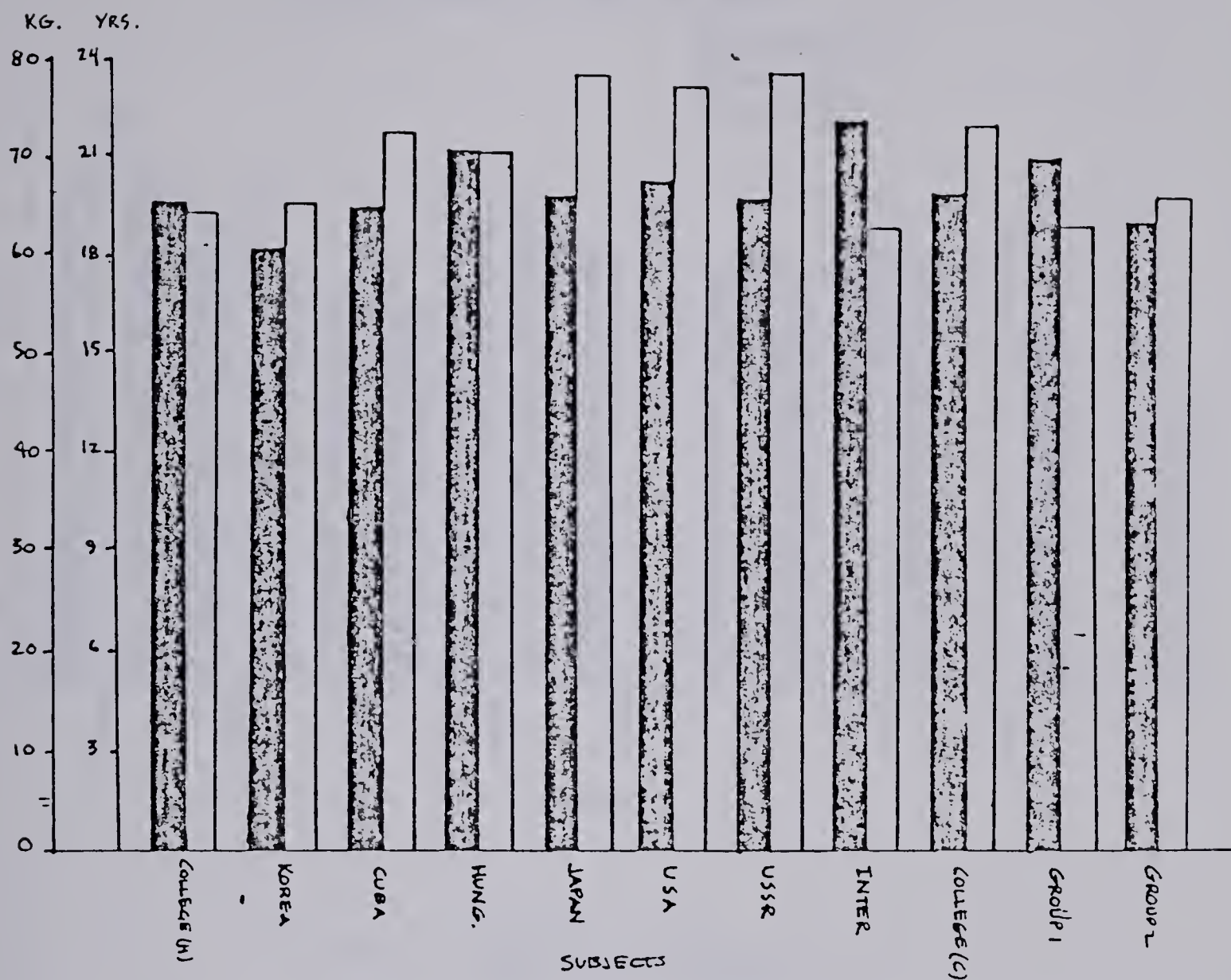


FIGURE 4 : COMPARISON OF AGES, WEIGHTS OF SELECTED VOLLEYBALL GROUPS AND NATIONAL TEAMS

KEY: COLLEGE (H) = HOSLER'S SUBJECTS, COLLEGE (C) = CONGER'S SUBJECTS, HUNG = HUNGARIAN NATIONAL TEAM

FIGURE 5 : COMPARISON OF SARGEANT, SPIKE AND BLOCK JUMPS
OF NATIONAL TEAMS TO GROUP 1 AND GROUP 2

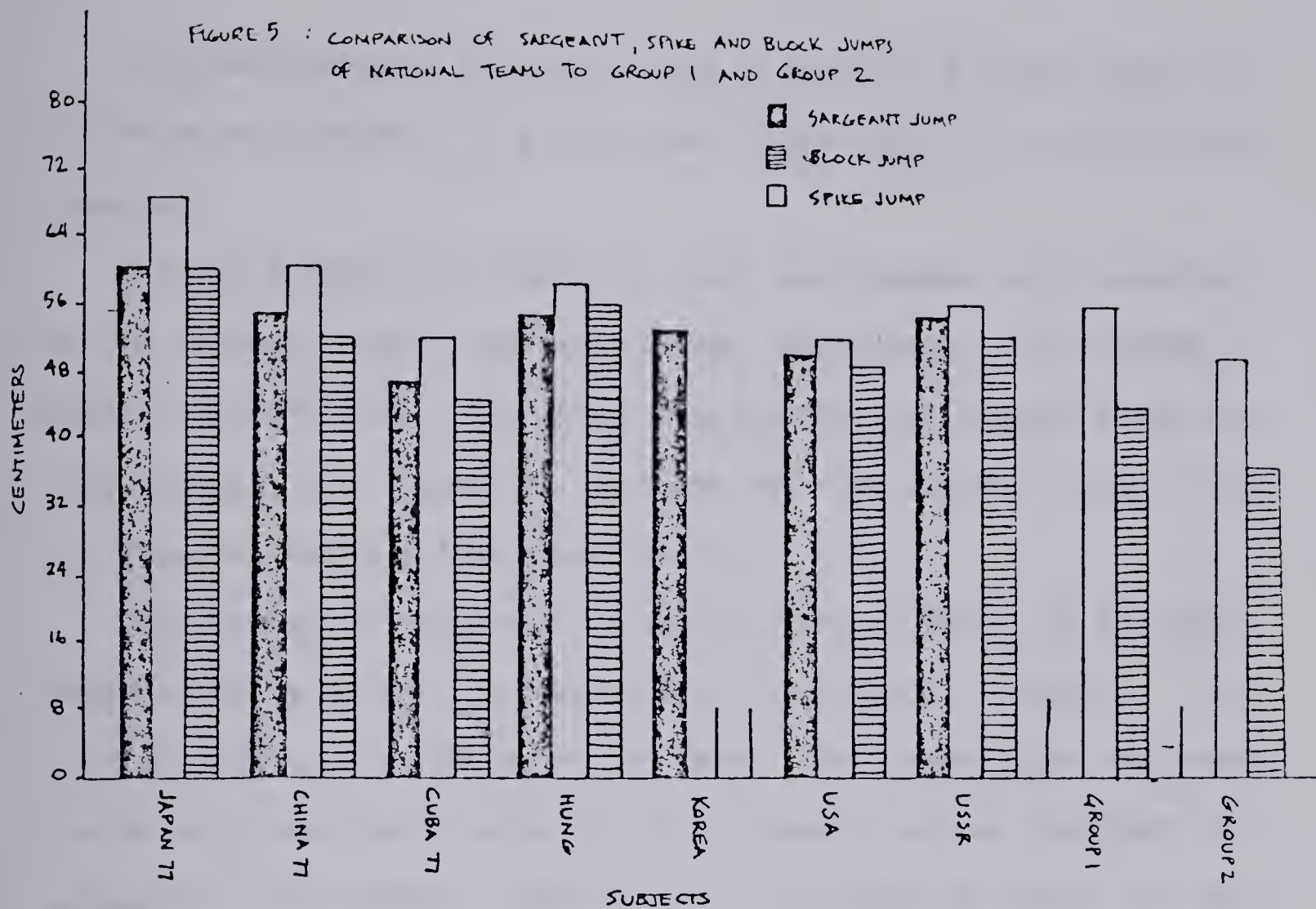
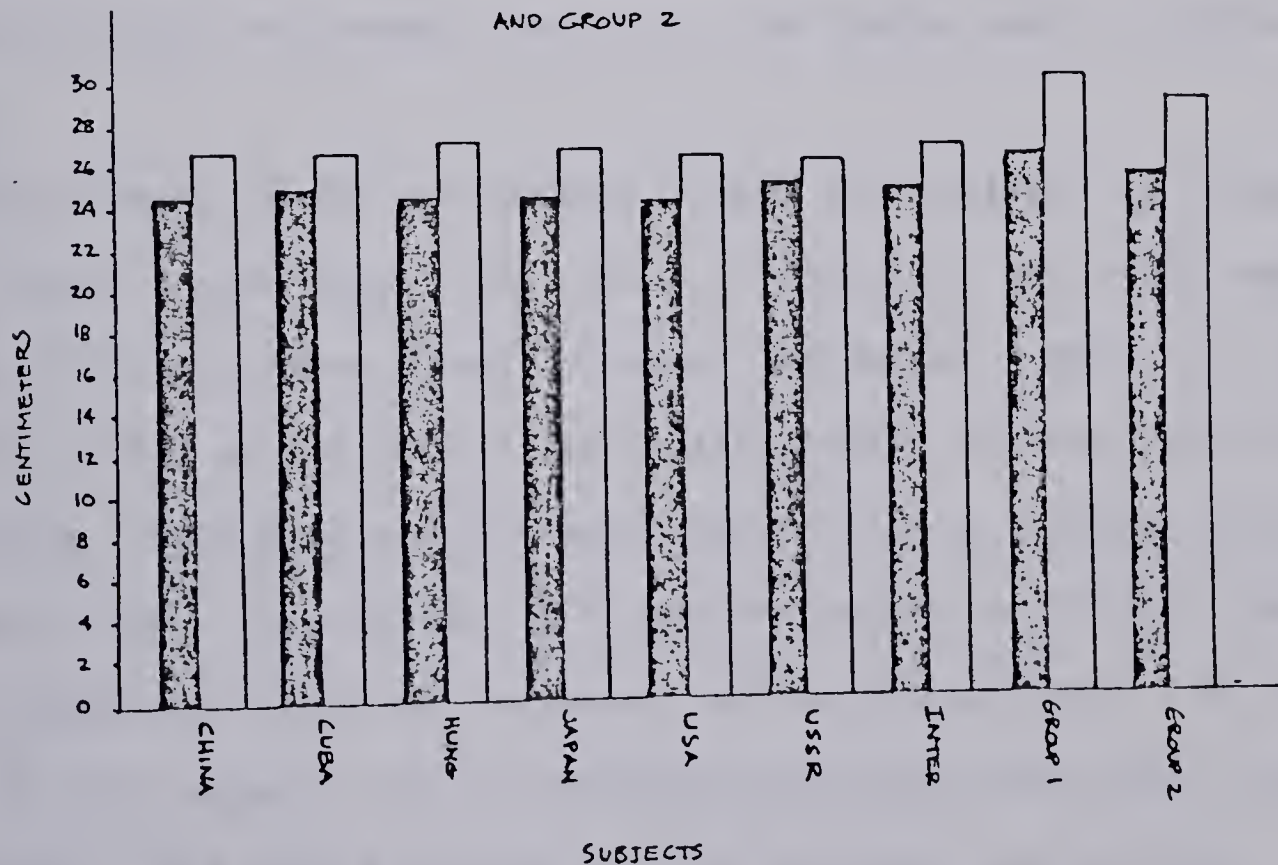


FIGURE 6 : COMPARISON OF THE
ARM GIRTHS MEASUREMENTS OF
NATIONAL TEAMS TO GROUP 1
AND GROUP 2



KEY: ■ FOREARM GIRTH □ BICEPS GIRTH
 HUNG = HUNGARY INTER = INTERNATIONAL MEANS
 GROUP 1 = CANADIAN NATIONAL PLAYERS GROUP 2 = CANADIAN NON-NATIONAL

Girth measurements of Group 1 were in general, a little larger in the thigh measurement and average calf girth size by international standards.

Sitting heights and stand and reach measurements were dependent on the player's height and body length measurements. The Group 1 players generally had longer trunk measurements and greater stand and reach heights than Hungarian, Japanese and International norms, but less than the American team measurements.

Measurements of biacromial diameters found in Hosler et al (1979) showed slightly smaller dimensions than the players in Group 1. The bi-iliac diameters were almost the same. The investigator believed the ratio of shoulder diameter/bi-iliac diameter was an important relationship that affected performance. According to Gerber et al. (1974) and Cureton (1951) athletic bodies have greater shoulder diameters than hip diameters, and it was thought that the closer the female approached this shape, the better the female would be athletically.

Measurement of fat percentages showed the subjects in Group 1 have greater values than those found in Hosler et al (1979) and a little lower than those found by Conger and Macnab (1967). It has been the belief of the investigators Sills (1953), Plowman (1974) and Hebbelinck (1953) that the less percentage of fat an athlete carries, the more likely that athlete will perform better on fitness tests. Girth dimensions often are dependent on fat percentages. In many cases if all subjects' fat percentages were similar then their girth dimensions would depend largely on size of bones and muscles. An athlete with low fat percentages and large girth and length

measurements would probably have an advantage in athletics (Krakower, 1941; Clarke, 1961; Conger and Macnab, 1967; Khosla, 1971; Gerber, 1974; Alexander, 1976; Morrow et al., 1979).

COMPARISON OF RESULTS ON LESS SKILLED PLAYERS TO RESULTS OF OTHER STUDIES

Compared to the sample studied by Hosler (1979) Group 2 was somewhat lighter, about three centimeters taller, and had approximately three per cent greater body fat. Examination of their bi-iliac and bi-acromial diameters revealed that both groups were quite similar in these dimensions.

Compared to Conger and Macnab's group (1967) Group 2 was taller and heavier. Percentage of body fat for the 2 groups was almost the same.

When Group 2 was compared to the International norms, and national team norms, they were within two to three centimeters of most players average height. The weight norms were slightly lower. The girth measurements for Group 2 showed slightly larger thigh and biceps measurements, and forearm and a calf girths that ranged from similar measurements to slightly smaller circumferences.

The stand and reach measurements and the trunk length measurements showed similar means between Group 2 and other international samples.

The investigator believed the anthropometric measurements of Canadian players, especially in Group 1, would be very similar to

those of other National calibre players. It was felt that the fitness scores and skill performance scores would be the figures that differed the most.

The investigator believed several measures to be possible factors in performance skill. It was felt that height was an important factor in sport skill success (Lamp, 1954, Alexander, 1976). Although height did not appear to affect skill measurements, it was related to several length, girth and diameter measurements. Through observation, by the investigator the ratio of calf girth/ ankle girth was thought to be an important measure for agility; the larger the ratio the more agile the athlete. However, this ratio could have been affected by large amounts of adipose being measured rather than muscle fibres in the calf girth measurement.

Weight measurements may have been influenced by other factors. The weight of an individual may have been due more to muscle bulk than adipose tissue. There was no accurate and simple way of determining whether a good athlete was heavier than the other non-skilled athlete because of increased muscle bulk or extra fat.

The 46° arch angle for both Group 1 and Group 2 was almost the same as for the general population (Clarke, 1976).

Very few studies have tested volleyball players to determine all of the anthropometric measurements that were used in this study. Only some of the measurements that have actually been tested have been discussed.

FITNESS SCORE MEANS FOR THE NATIONAL LEVEL PLAYERS COMPARED TO RESULTS OF OTHER STUDIES

According to the fitness scores of other International players found in Table II, the Group 1 fitness scores were similar in many cases. Group 1, however, averaged several years younger than most of the other international subjects tested. The investigator believed that age would not affect the anthropometric and fitness scores, as much as it would affect performance in the actual game situations. Group 1 appeared to have a slightly higher reading for grip strength scores.

The spike jump and block jump scores were slightly below the jump score means for other international players (Table II). The Group 1 spike jump score of 60.91 was higher than those scores recorded for the American, Hungarian and Cuban teams. The Group 1 block jumps scores were lower than all of the international subjects shown in Table II.

The three successive broad jumps, shuttle run and jump and reach scores were quite similar.

One factor that may have affected volleyball physical fitness scores must be considered. Quite often, one country interested in volleyball, will test other countries. Some subjects may not perform maximally, because of political, tactical or psychological reasons. Some subjects from a few countries may have not performed maximally, for the purpose of deceiving their opponents, so that their skill level would be underestimated.

FITNESS SCORE MEANS FOR THE LESS SKILLED GROUP COMPARED TO RESULTS OF OTHER STUDIES

The investigator believed that fitness scores for Group 2 would be lower than the scores for most international players. The grip strength score for Group 2 was almost in the middle range of international scores, tending to be slightly lower.

The spike and block jump scores for Group 2 were considerably lower than most of the international scores. The lowest international score was Cuba at 52.83 for spike jump, and 46.25 for block jump. These figures were very surprising in that Cuba is believed to have some of the best jumpers in the world.

Group 2 rated very low compared to the International subjects on the triple jump and jump and reach scores.

Group 2 was of average height compared to the International scores. Therefore lower scores on the three successive broad jumps and jump and reach were subsequently interpreted as being due to inferior leg power of Group 2 compared to the international subjects. The superior leg power found in the international subjects was probably a direct result of extensive training. It was highly unlikely that Group 2 had been trained as extensively prior to the fitness test.

The results of the shuttle run for Group 2 indicated the subjects in general were slightly slower than the Japanese (1970) and the Chinese (1973) players. A score of 14.63 seconds was slightly faster than the Korean score of 14.9 seconds. This comparison was surprising since the Korean style of volleyball has always been based on quick

TABLE II
FITNESS MEASURES OF SELECTED VOLLEYBALL GROUPS

Subjects	Date	Age Yrs.	Grip (Right) kg.	Sargeant Jump cm.	Spike Jump cm.	Block Jump cm.	Triple Jump cm.	Shuttle 9 MX 3 secs	Jump & Reach cm.
CANADA	1979	19					700		290
JAPAN	1970		35.5	54.9			646	14.1	
JAPAN	1977	23.3	38.75	60.94	69.0	60.17			
CHINA	1973	24.4	39.4	61.6	68.9	59.6	696	14.2	290
CHINA	1977	21.9	41.5	55.8	60.9	52.1			
CUBA	1977	21.3	34.82	47.08	52.83	45.25			
HUNGARY	1977	23.6	37.6	55.09	59.4	51.64			
KOREA		19.7		54.3			704.5	14.9	
USA	1977	22.8	41.8	51.2	52.7	49.6			
USSR	1977	19.1	39.96	55.57	62.5	53.25			
INTERNATIONAL									
NORMS	1977	22.1	39.6	59.0	66.9	59.9			
GROUP 1	1979	19.07	41.23		60.91	44.55	692.82	14.22	287.83
GROUP 2	1979	20.00	38.18		50.39	38.26	626.04	14.63	270.45

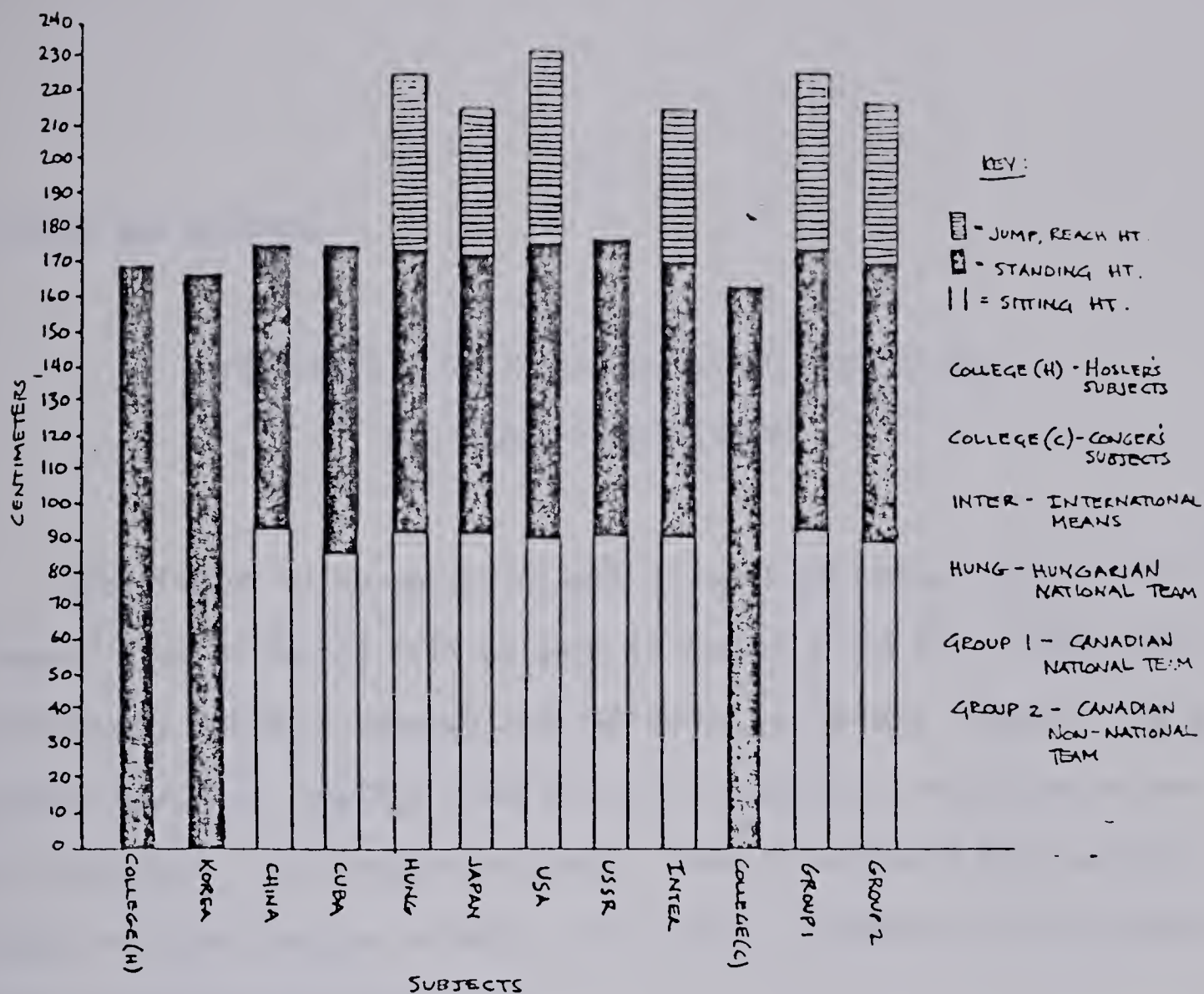
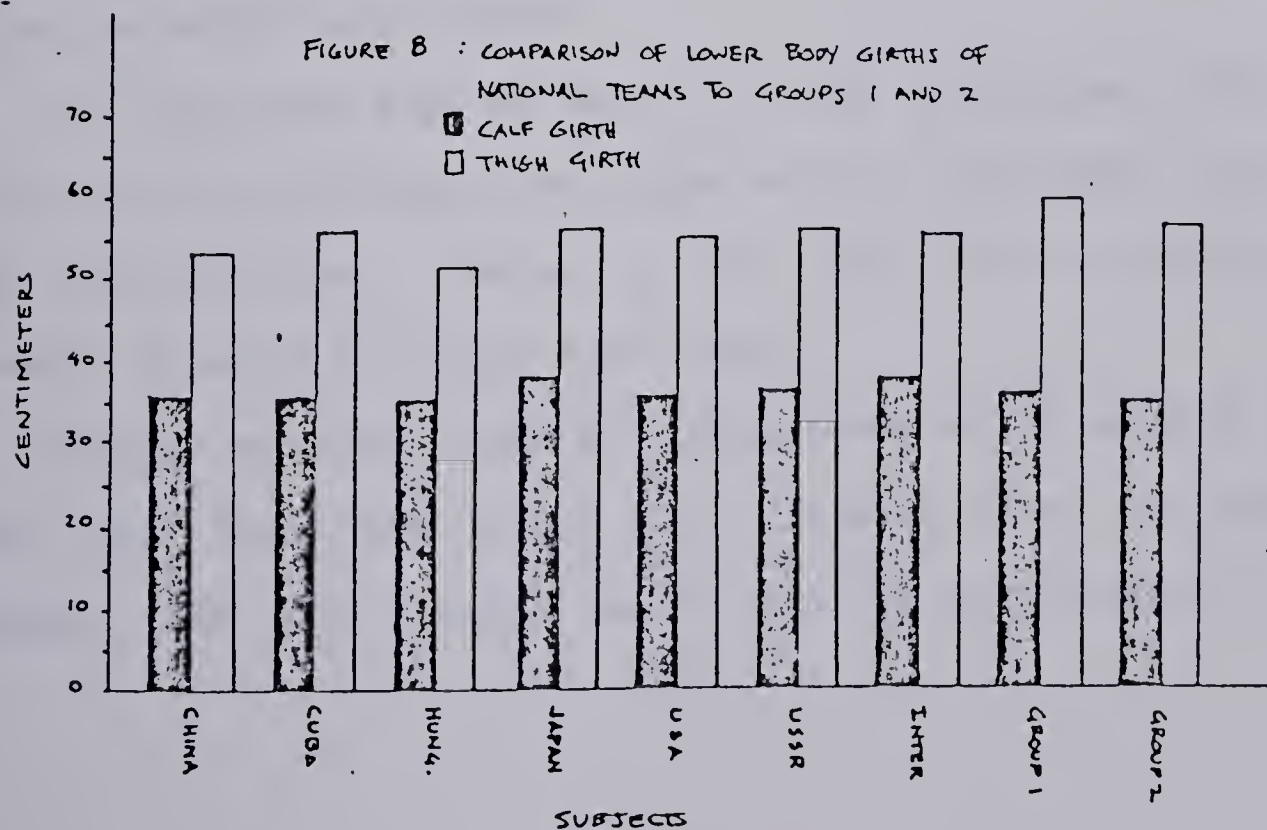


FIGURE 7 : COMPARISON OF JUMP, STANDING, AND SITTING HEIGHTS OF SELECTED SUBJECTS



offense and defense.

DIFFERENCES BETWEEN NATIONAL LEVEL PLAYERS AND THE LESS SKILLED PLAYERS

Significant differences between Group 1 (National Players) and Group 2 (Non-National) (can be seen in tables 3 and 4). Significant differences appeared between the following variables. Group 1 had a greater arm span, greater chest and wrist diameters, and higher scores for the spike, block and broad jumps. Group 1 indicated they participated in higher leagues of play. The Group 1 subjects also performed better on the wall volley test.

As was stated earlier, weight and height were factors in many measurements. For example, the very tall and heavy subjects would probably have greater body dimensions that were proportional to their height and weight measurements.

The larger arm span for Group 1 was an interesting factor. The height differences between the Groups was not significant but the arm span difference was. Perhaps the arm span and grip strength differences affected the volley test scores.

Group 1 recorded longer arm spans, therefore it would be logical that their total arm length which includes lower and upper arm lengths, and hand lengths would also be significantly longer.

TABLE III

ANTHROPOMETRIC MEASUREMENT DIFFERENCES
BETWEEN CANADIAN NATIONAL PLAYERS (GROUP 1) AND
CANADIAN NON-NATIONAL PLAYERS (GROUP 2)

<u>VARIABLE</u>	<u>$\bar{X}$ GROUP 1</u>	<u>$\bar{X}$ GROUP 2</u>
chest diameter	* 28.19 cm.	26.06 cm.
arm span	* 180.08 cm.	172.68 cm.
wrist diameter	* 5.47 cm.	5.08 cm.
height/weight ratio	* 2.50	2.74
weight	* 71.39 kg.	64.23 kg.
forearm girth	* 26.65 cm.	25.74 cm.
shoulder diameter	* 38.53 cm.	36.74 cm.
knee diameter	* 9.28 cm.	8.68 cm.
stand and reach	* 227.45 cm.	219.64 cm.
trunk length	* 94.13 cm.	90.07 cm.
ankle diameter	* 6.79 cm.	6.41 cm.
chest girth	* 92.83 cm.	88.99 cm.
arm length	* 77.28 cm.	74.79 cm.
abdominal girth	* 87.01 cm.	81.94 cm.
hand length	* 18.79 cm.	17.88 cm.
lower arm length	* 46.63 cm.	45.50 cm.
upper arm length	* 30.75 cm.	29.25 cm.
ankle girth	* 25.60 cm.	24.73 cm.
height	176.50 cm.	172.50 cm.
hip girth	100.45 cm.	98.51 cm.
thigh girth	60.35 cm.	58.14 cm.
biceps girth	30.13 cm.	29.08 cm.
billiac diameter	28.39 cm.	27.95 cm.
leg length	82.25 cm.	82.11 cm.
lower leg length	48.75 cm.	47.43 cm.
upper leg length	33.55 cm.	35.25 cm.

N.B. Astericks (*) denotes significance at the .05 level.

TABLE IV

SKILL AND FITNESS MEASUREMENT
DIFFERENCES BETWEEN CANADIAN NATIONAL
LEVEL PLAYERS (GROUP 1) AND CANADIAN NON-NATIONAL PLAYERS (GROUP 2)

<u>VARIABLE</u>	<u>$\bar{X}$ GROUP 1</u>	<u>$\bar{X}$ GROUP 2</u>
spike jump	*287.83 cm.	270.45 cm.
block jump	*272.83 cm.	257.91 cm.
3 broad jumps	*692.82 cm.	626.04 cm.
level of play	* 7.0	4.75
volley test	* 45.62/min.	41.48/min.
vertical jump	* 60.91 cm.	50.39 cm.
athletic ability	* 8.04	7.21
experience	* 4.5 yrs.	6.32 yrs.
shuttle run	* 14.22 secs.	14.63 secs.
flexibility	18.7	15.27
pushups	23	22.3
grip strength	41.23 kg.	38.18 kg.
volley test	45.6	41.48
serve test	23.2	23.06
volleyball ability evaluation	7.46	6.82

N.B. Astericks (*) denote significance at the .05 level.

A good jump, long arms and hands would be an advantage in blocking and spiking in a game situation (Gladden and Colacine, 1979). This was also indicated by the fact that the Group 1 subjects scored significantly higher on the block jump and spike jump tests.

Group 1 indicated significantly greater trunk length, and stand and reach height. Again it was believed that a long trunk and a high individual reach would be an advantage in the game of volleyball which requires that players reach as high as possible over a net.

Group 1 was bigger in size generally. This statement was supported by the facts that Group 1 had significantly greater abdominal, forearm, chest and ankle girths, as well as greater shoulder, chest, knee and ankle diameters. See Table III.

The percentages of body fat for each group were very similar. Based on this fact, the investigator believed that many differences in body girths or diameters were caused by a greater muscle and/or bone mass in Group 1 subjects. Greater muscle mass in sports is often an advantage. (Sills 1953, Clarke 1961, Plowman 1974)

Several other Group 1 scores indicated that this particular group was more agile and powerful. Group 1 ran a significantly lower shuttle run time, and scored significantly higher on the vertical jump. See Table III.

Group 1 did not rate themselves higher on volleyball ability, yet rated themselves higher on general athletic ability. Although self-evaluation scales may not be accurate, these answers may have

revealed some interesting thoughts to consider. Group 1 had significantly less volleyball experience, therefore these subjects may have ranked themselves lower in the volleyball ability question. It was obvious from their higher scores that they felt confident in their general athletic abilities. Group 1, then, may have been selected on the basis of their athletic ability rather than their volleyball ability. Another factor considered was the players' confidence. A confident person is often more capable of achieving maximum performance better than a self-effacing person. The subjects in Group 1 may have had more confidence and therefore performed better than the subjects in Group 2. The players' levels of confidence were thought to affect players' abilities and their subsequent selection to National teams. The level of play in which a player participated was either a result of the player's confidence or influenced the player's self-evaluation. Level of play, athletic ability and volleyball ability were all significantly correlated with each other.

Group 1 was slightly taller, although this difference was not significant. It was believed prior to taking height measurements, that height would be very different between the groups. The small sample size of 41 subjects may have affected this factor. In this relatively small sample, one or two subjects who were extremely tall but uncoordinated and slow, may have affected this result. Height was believed by the investigator to be a very important factor in success

of a volleyball player. Obviously it could not be the only factor, but a good tall player is normally a stronger player than a good small player. It has appeared that a mediocre tall player could outperform a good short player. A short player has to jump more often, and maximally, to perform on an even basis with a tall player. Fatigue becomes a factor in long matches, and the advantage of height becomes apparent.

Group 1 had larger chest and biceps girths (see Table III). These measurements in all likelihood measured the musculature of the individual.

Although not significant, there were several ratio differences between Group 1 and Group 2. Group 1 had lower ratios of shoulder diameter/chest diameter, height/arm length, and height/trunk length. These ratios indicated certain factors were important. Since Group 1 had greater shoulder and chest diameters, the shoulder diameter/chest diameter ratio suggested that the "broad shouldered - narrower chested" shape was an advantage. As discussed earlier, this athletic shape was believed to be an advantage.

The height/arm length ratios of Group 1 suggested to the investigator that arm length was important. The longer the arms, the better the chance of success in volleyball.

The height/trunk length ratio indicated that the longer trunk was an advantage in volleyball.

Related to the importance of the arm measurement, was the slightly higher arm span/height. Group 1 had a slightly higher arm

span/height ratio which indicated that a long arm span was an athletic advantage in playing volleyball.

The ratio of weight/height was significantly higher in Group 2 (See Table III). This indicated that weight had to be in proportion to height. For example, a subject should not be too heavy for her height. This is demonstrated by the fact that both groups were almost the same height, but Group 1 was heavier. Since Group 2 had a higher weight/height ratio, the relationship of weight and height must be important and must remain in proportion. Results of the group differences seemed to indicate that the National level players were bigger, and performed better on the fitness and volley tests. Length of the body parts, especially arm span, were good indicators of superior volleyball skill. This finding may be a helpful tool to measure and determine top level players. For complete results review see Appendix C.

CRITERIA FOR SELECTION OF

A HIGHLY SKILLED TEAM

One of the purposes of this study was to determine if there were any structural, fitness, and/or skill factors that would differentiate those National level, Canadian female volleyball players from the non-national Canadian female players.

Table III shows the anthropometric differences in means between the Canadian National players and the non-national players.

The Canadian National players were significantly larger in all of the anthropometric measures (See Table III). These measurements included chest diameter, arm span, wrist diameter, weight, forearm girth, shoulder diameter, knee diameter, stand and reach, trunk length, ankle diameter, arm length, abdominal girth, hand length, lower arm length, chest girth, upper arm length and ankle girth. Only one anthropometric ratio was significantly different between the two groups, namely height/weight. The National players were lower in this ratio.

In the skill tests, the Canadian national players scored significantly ($p = .05$) better on spike jump, block jump, broad jump, level of play, vertical jump, athletic ability ranking and shuttle run, as seen in Table IV. It is interesting to note that these same players had fewer years volleyball experience than the non-National players. Determining the quality of these experiences was not included in this study.

Selection of the Most Skilled Players Based on Anthropometric Measures

Eighteen anthropometric variables as measured in this study indicated significant differences between the National players and the non-national players. These anthropometric variables could be useful to coaches to help determine and select their more highly skilled players (See Table III).

Coaches may not have time to measure all anthropometric variables therefore only the all encompassing or easily measureable variables were identified as testing material.

Several of the eighteen anthropometric variables were highly correlated with each other, therefore any of the variables could be used to test. The variable that was the easiest to test, would likely be one of the better ones to use.

Of those variables with several components (for example, arm span includes hand length, lower arm length, upper arm length) the 'all-inclusive' variable was selected rather than one of the components.

Chest diameter was highly correlated with weight ($r=.813$ $p = .0001$) and chest girth ($r = .831$, $p= .0001$). Any of these variables could be utilized in testing.

Arm span was another important anthropometric variable that identified the more highly skilled players. This measurement was highly correlated with weight ($r = .708$, $p = .0001$), arm length ($r = .849$, $p. = .0001$), lower arm length ($r = .867$, $p. = .0001$), hand length ($r = .738$, $p = .0001$), and stand and reach ($r = .905$, $p = .0001$). Since arm span and stand and reach were all-inclusive type variables, either arm span or stand and reach could be used to identify highly skilled players. All of the other variables within arm span, were eliminated from the test items.

Wrist diameter was a third important variable that identified a significant difference between the National players and the non-national players. This variable was not highly correlated ($r \leq .700$) with any of the other eighteen significant anthropometric variables

therefore remained as a measurement that would be valuable to use in selecting a team.

The height/weight ratio was another most significant variable indicating a difference between the National players and the non-national players. This ratio was highly correlated with the following anthropometric variables: weight ($r = -.918$, $p = .0001$), chest girth ($r = -.809$, $p = .0001$), and knee diameter ($r = -.722$, $p = .0001$). The height/weight ratio therefore was selected as the all-inclusive test measurement. Weight, chest girth and knee diameter measurements could also be used.

Forearm girth and shoulder diameter were not highly correlated ($r \leq .700$) with any of the top eighteen anthropometric measures. These variables were also selected as test measures.

The trunk length and ankle diameter measurements were not highly correlated ($r \leq .700$) with any of the other eighteen anthropometric measurements. Trunk length and ankle diameter measurements were selected as test measures.

Abdominal girth and ankle girth measurements were the last two anthropometric variables that were selected as testing measures. Only weight was highly correlated with abdominal girth ($r = .739$, $p = .0001$) and weight was correlated with the height/weight ratio which was already identified as a test measure.

The following anthropometric measurements were selected as the best variables to test for highly skilled players: chest diameter, arm span, chest girth, knee diameter, wrist diameter, height/weight ratio, forearm girth, shoulder, trunk length, ankle diameter, abdominal

girth, and ankle girth. Since these test items did not require skill as a prerequisite, they could be performed on the experienced and inexperienced players.

Selection of the Most Skilled Players Based on Fitness and Performance Measures

The physical fitness variables that identified the most skilled players were: spike jump, block jump, three successive broad jumps, vertical jump, and shuttle run. The skill variables that identified the most skilled players were: level of play, Volley test, athletic ability, and experience. (See Table IV.)

The only two skill variables that correlated highly with each other ($r \geq .700$) were the spike jump and block jump measurements ($r \geq .949$). Therefore, either one of these two tests could be used to select the more highly skilled players.

The experience, athletic ability, level of play, block, spike, and volley test questions were answered on the basis of each player's previously acquired experience and skill. These particular test items may not have allowed an inexperienced player, with potential, to score better than an experienced player. The broad jump, vertical jump and the shuttle run did not require the subject to be an experienced player. Since these tests were not skilled-loaded, young, potentially high skilled players could be identified on the basis of these tests. There were significant differences between the National and

non-national players, in the jump tests, the volley test, shuttle run, experience, athletic ability, and level of play. What were the anthropometric variables that related with these differences? For example, if the highly skilled players scored well in the Volley test, what physical and structural characteristics did these athletes have that showed some positive relationship to performing well on the test?

The factors that were highly related to skill and performance measures had to be identified. These factors could be used to identify the inexperienced athlete who was physically talented but not yet skilled at the game because of a lack of experience.

It was already determined that the eight skill performance variables listed in Table VI, identified some differences between the National players and the non-national players. These skill performance variables were often related highly with several anthropometric variables ($r \geq .700$).

The one anthropometric variable that correlated highly with seven of eight performance variables, was chest diameter. The knee and wrists diameter variables were found to be correlated with six of the eight performance variables. The chest and abdominal girth variables correlated with five of eight performance variables, and arm span, trunk length, arm length, upper arm length, hand length, stand and reach, ankle girth and shoulder diameter variables all correlated with four of the eight performance variables.

If an anthropometric variable correlated with many of the

TABLE V
RELATIONSHIP OF ANTHROPOMETRIC AND FITNESS
VARIABLES TO SKILL PERFORMANCE VARIABLES

(-) INDICATES A NEGATIVE CORRELATION

BLOCK JUMP	BROAD JUMPS	SPIKE JUMP	SHUTTLE RUN	VERTICAL	VOLLEY TEST	EXPERIENCE	LEVEL OF PLAY
HT	ASP	ASP	WT(-)	ARCH(-)	WT	AG	VO
ASP	TL	HT	HT(-)	SHD	ASP	TL(-)	ULL
TL	AL	TL	ABG(-)	CHD	AL	KND(-)	STRE
LL	UAL	LL	CHG(-)	ANKD	UAL	WRD(-)	CHD
LLL	HL	LLL	BIG(-)	SPJ	LAL	POS	WRD
AL	STRE	AL	SHD(-)	SH(-)	HL		SPJ
UAL	ABG	UAL	CHD(-)	BLJ	ABG		BLJ
LAL	CHG	LAL	KND	BJ	HIPG		BJ
HL	ANKG	HL	SPJ(-)	POS(-)	CHG		VBAB
STRE	CHD	STRE	BJ(-)	VBAB	BIG		GAB
ABG	KND	ABG	GP(-)	GAB	FRG		RI
HIPG	WRD	HIPG	GAB(-)	R3	ANKG		R2(-)
CHG	SPJ	CHG	VJMP(-)	R9	CHD		
FRG	SH(-)	FRG	R7	R11(-)	KND		
ANKG	BLJ	ANKG			WRD		
SHD	VO	SHD			SPJ		
CHD	LEV	CHD			BLJ		
BIILD	GAB	BIILD			BJ		
KND	VJMP	KND			LEVEL		
ANKD	R1	ANKD			VB AB		
WRD	R2(-)	WRD			R2(-)		
SPJ	R4(-)	SH(-)			R7(-)		
BJ		BLJ					
GP		BJ					
VO		GP					
POS(-)		VO					
VB AB		POS(-)					
VJMP		LEV					
LEV		VBAB					
R13		VJMP					

KEY: All the above variables are $r \geq .70$, and were selected to include in this table on that basis.

(WT = weight, HT = height, ASP = arm span, TL = trunk length, LL = Leg Length, LLL = lower leg length, AL = arm length, UAL = upper arm length, LAL = lower arm length, HL = hand length, STRE = stand and reach, ABG = abdominal girth, HIPG = hip girth, CHD = chest diameter, BIILD = bi-iliac diameter, KND = knee diameter, ANKD = ankle diameter, WRD = wrist diameter, SPJ = spike jump, BJ = 3 successive broad jumps, GP = grip, VO = volley, LEV = level of play, POS = position played, VBAB = volleyball ability, VJMP = vertical jump, SH = shuttle run, BLJ = block jump, GAB = general athletic ability, BIG = biceps girth, ARCH = arch angle, AG = age, R = ratio).

performance variables that identified the highly skilled players, then that anthropometric variable could also be used as a performance indicator.

Thus the diameter measurements (chest, shoulder, knee wrist) appeared to be important, discriminating variables. The three girth measurements (ankle, chest, abdominal) also appeared to be discriminators of skilled players. The length measurements (arm span, trunk length, arm length, upper arm length, hand length, stand and reach) correlated with several performances variables. Arm length, upper arm length and hand length were all a part of the total arm span, therefore, only the arm span measurement was used as a test variable. These selected variables could be used to identify those highly skilled but inexperienced players.

Summary of the Anthropometrical, Fitness and Skill Measurements that Could be Utilized to Select Highly Skilled Players

Many times coaches must select players on the basis of present ability levels and/or future ability levels. If the players were already experienced and skilled in the game, then the following variables could be used to identify the most highly skilled players: spike jump, block jump, three successive broad jumps, level of play, volley test, vertical jump athletic ability, experience, shuttle run, chest diameter, arm span, wrist diameter, height/weight ratio, forearm girth, shoulder diameter, trunk length, ankle diameter, abdominal girth, ankle girth, knee diameter, chest girth, and stand and reach.

If the players were not experienced at the game, the following non skill-loaded variables could be used: three successive broad jumps, vertical jump, shuttle run, chest, wrist, shoulder, knee and ankle diameters, arm span, height/weight ratio, trunk length, stand and reach, forearm, abdominal, chest and ankle girth.

FURTHER DISCUSSION AND COMPARISON WITH OTHER STUDIES

In this study volleyball skill appeared to be related to physical size. Several researchers have found similar results, relating skill to size. Krakower (1941) found that good jumpers were tall, had long legs and broad feet. Clarke (1957) correlated various anthropometric measurements with fitness measurements, and found that body weight and hip width were related to most measurements. Espenschade (1963) revealed significant correlations between fitness tests and height and weight measurements of 10 to 18 year old boys and girls. Thorsen (1964) after testing anthropometric measurements of the lower body found significance between weight and strength variables. He found size, length and/or bulk measurements of the trunk and legs to be related to physical performance in females.

Clarke (1961) believed athletic indicators were strength, size, weight, age, strength and power. DiGiovanna (1943) after testing several types of athletes found basketball players to be more

powerful, heavier, taller, and also found these players to have greater sitting heights, leg lengths, shoulder diameters and arm span. Alexander (1976) found that the more highly skilled basketball players were taller and heavier than the less skilled players.

Some variables and factors should be discussed along with the various correlations. The investigator has always believed that skill tests do not test an individual's game ability. Many other factors overshadow an individual's raw ability in a game. It was felt that those skill tests do assess an individual's ability to volley against the wall and serve to specific areas. Fawcett (1978) also agreed with these ideas. The serve test especially was believed to be very inaccurate in describing a player's serving ability. When the investigator tested for serve accuracy it was observed that some serves, even, though they did not land in a high scoring area, would have been very difficult serves to receive, because they were hard, fast and floating. Other subjects served very easy, high serves that landed in high scoring areas. Serving targets in a game also depend on opponents' receiving positions.

Some of the fitness tests involved a learning process. The broad jumps, spike and block jump process usually improved after the method of jumping was learned.

Other variables that should have been questioned, were the diameters. It was not known whether large diameters represented large boned, fat or muscled subjects. The questionnaires on self-

evaluation may not have been valid measuring tools. It appeared that most of the good athletes underestimated their abilities, while some of the less skilled athletes overestimated themselves.

Several researchers have found anthropometric measures to be related to volleyball skills. Lamp (1954) and Shondell (1971) felt weight and size were important for a volleyball player.

Other researchers, Gladden and Colacino (1979), Mohr and Haverstick (1956), found vertical jump was related to volleyball success. Lamp (1954), Shondell (1971) and Morrow et al. (1979) felt strength was an important factor affecting volleyball success, while Shondell (1971), Mohr and Haverstick (1956), and Morrow et al. (1979), found that speed and agility were related to ability.

CHAPTER V

SUMMARY AND CONCLUSIONS

SUMMARY

A group of skilled female volleyball players was tested to determine if anthropometric measurements were related to fitness and volleyball ability. Each subject was measured for sixty-six lengths, girths, weights and diameters, and subjected to various fitness, power tests and volleyball skill tests. Correlations were computed to determine if any anthropometric measurements were related to fitness and volleyball scores. The players were divided into two groups on the basis of ability; Group 1, the National level players and Group 2, the less skilled and non-national level players. The anthropometric, physical fitness and skill measurements of Group 1 and Group 2 were also compared to other countries national and non-national players. Significant differences between anthropometric fitness and skill measurements were calculated between Group 1 and Group 2. Based on the differences between these groups and correlation analysis of all variables, a battery of anthropometric, fitness and skill tests was developed that would possibly identify the more highly skilled players.

CONCLUSIONS

The area of anthropometric measurements as it relates to skill and fitness, needs more research. Since relatively few studies have been done in these areas, especially with volleyball, it was difficult

to compare results and formulate conclusions about some of the anthropometric measurements used in this study.

On the basis of the preceding study, the following conclusions were justified:

1. National level subjects were generally taller and heavier than both normal subjects and other volleyball players.

2. The subjects in this study did not appear to differ in anthropometric measurements, from other international volleyball player scores.

3. Anthropometric measurements were closely related to fitness and volleyball skill scores.

4. The fitness scores of the Canadian national level players were very similar to those of other international volleyball players, except for Group 1 jump scores which were slightly lower.

5. Group '2 was below selected fitness scores when compared to international players scores.

6. National level players showed significantly ($p \leq .05$) greater mean scores, than non-national players, on the following anthropometric variables: chest, wrist, shoulder knee, and ankle diameters, arm span, height/weight ratio, weight, forearm, chest, abdominal and ankle girths, stand and reach, trunk, arm, hand, lower and upper arm lengths.

7. The national level players showed significantly ($p \leq .05$) greater mean scores than non-national players on the following fitness and skills measures: spike, block, vertical and three successive broad jumps, level of play, experience, volley test, athletic ability, and shuttle run.

8. The following anthropometric variables appeared to be the best indicators of volleyball success: chest diameter, arm span, wrist diameter, height/weight ratio, forearm girth, shoulder diameter, trunk length, ankle diameter, abdominal girth, ankle girth, knee diameter, chest girth, stand and reach.

9. The following fitness and skill variables appeared to be the best indicators of volleyball success: spike jump, block jump, three successive broad jumps, level, volley test, vertical jump, athletic ability, experience and shuttle run.

10. A good battery of tests that a coach could utilize for team selection would include any or all of the measurements included in conclusions 7 or 8 above.

RECOMMENDATIONS

The following recommendations have resulted from this study:

1. The number of subjects to be measured should be increased, to ensure greater accuracy in the anthropometric measures of female volleyball players.
2. An attempt should be made to compare the anthropometric measurements of highly skilled female volleyball players to those of normal female subjects, to ensure that special volleyball characteristics do exist.
3. A battery of reliable and valid volleyball skill tests should be developed, which can discriminate between skilled and unskilled players in a game situation.
4. Volleyball players should be tested at the peak of their training period, to ensure that test results are optimal.

REFERENCES

BIBLIOGRAPHY

Albright, Bob and Jeff Boone. "Y's Way to Physical Fitness. Women's Fitness Norms," Journal of Physical Education, 75: 18-20, 1977.

Alexander, Marion J.L. "The Relationship of Somatotype and Selected Anthropometric Measures to Basketball Performance in Highly Skilled Females," Research Quarterly, 47:575-585, 1976.

Astrand, P.O. in Gerber, Ellen et al. The American Women in Sport. Don Mills, Ontario: Addison Publishing Co., 1974.

Bach, in Martiny, G. "Scientific Approach to Modern Volleyball," Scarborough, Ontario: Canadian Volleyball Association Publications, 1972.

Barrow, Harold M. and Rosemary McGee. Measurement in Physical Education. Philadelphia: Lea and Febiger, 1964.

Baumgartner, Ted A. and Andrew S. Jackson. Measurement For Evaluation in Physical Education. Boston: Houghton Mifflin Company, 1975.

Beall, E. in Alexander, M.J.L. "The Relationship of Somatotype and Selected Anthropometric Measures To Basketball Performance in Highly Skilled Females," Research Quarterly, 47: 575-585, 1976.

Bischoff and Liebig in Martiny, G. "Scientific Approach to Modern Volleyball," Scarborough, Ontario: Canadian Volleyball Association Publications, 1972.

Bookwalter, in Johnson, B.L. and K.L. Nelson. Practical Measurements For Evaluation in Physical Education, 3rd ed. Minneapolis: Burgess Pub. Co., 1979.

Boucher, Robert L. "Volleyball - Selected Bibliography," The Physical Educator, 36: 105-110, 1979.

Bowne, Mary E. "Relationship of Selected Measures of Acting Body Levers To Ball Throwing Velocities," Research Quarterly, 31: 392-402, 1960.

Brady, George. "Preliminary Investigations of Volleyball Playing Ability," Research Quarterly, 16: 14-17, 1945.

Broer, Marion R. "Reliability of Certain Skill Tests for Junior High School Girls," Research Quaterly, 29: 139-146, 1958.

Burley and Anderson in Mohr, D. and M. Haverstick. "Relationship Between Height, Jumping Ability and Agility to Volleyball Skill," Research Quarterly, 27: 74-78, 1956.

Burley, Lloyd R. and Helen C. Dobell and Betty J. Farrell. "Relations of Power, Speed, Flexibility and Certain Anthropometric Measures of Junior High Girls," Research Quarterly, 32:443-448, 1961.

Canadian Volleyball Association. "Protocol-Anthropometric Measurements," Canadian Volleyball Association Bulletin, 23: 469-503, 1979.

Canadian Volleyball Association. "Volleyball Statistics," Canadian Volleyball Association Bulletin, 16: 19-58, 1978.

Carter, J.E.L. in Gerber, Ellen et al. The American Women In Sport. Don Mills, Ontario: Addison Wesley Publishing Co., 1974.

Clarke, H. and R. Geser and S. Hundson in Clarke, H.H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall, Inc., 1976.

Clarke, H. Harrison. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall Inc., 1976.

Clarke, Harrison and Kay Peterson. "Contrast of Maturational, Structural, and Strength Characteristics of Athletes and Non-Athletes 10 to 15 Years of Age," Research Quarterly, 32: 163-176, 1961.

Clarke, Harrison. "Relationship of Strength and Anthropometric Measures to Physical Performance Involving the Trunk and Legs," Research Quarterly, 28: 223-232, 1957.

Clifton, M.A. "Single Hit Volley Test for Women's Volleyball," Research Quarterly, 33: 208-211, 1962.

Collins, D. Ray and Patrick B. Hodges. A Comprehensive Guide to Sports Skills Tests and Measurement. Springfield, Ill.: Charles C. Thomas, 1978.

Conger, Pat and Ross Macnab. "Strength, Body Composition and Work Capacity of Participants and Non-Participants in Women's Intercollegiate Sports," Research Quarterly, 38: 184-191, 1967.

Cox, Richard H. "The Relationship Between Selected Volleyball Skill Components and Team Performance of Men's Northwest "AA" Volleyball Teams," Research Quarterly, 45: 441-446, 1974.

Cunningham, P. and J. Garrison. "High Wall Volley Test for Women's Volleyball," Research Quarterly, 39: 486-490, 1968.

Cureton, Thomas Kirk Jr. Physical Fitness of Champion Athletes. Urbana: University of Illinois Press, 1951.

Cureton, Thomas in Gerber, Ellen et al. The American Woman in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Davenport, C.B. in Cureton, T.K. Physical Fitness of Champion Athletes. Urbana: University of Illinois Press, 1951.

DiGiovanna, Vincent. "The Relation of Selected Structural and Functional Measures to success in College Athletics," Research Quarterly, 14: 199-216, 1943.

Disch, Cathryn F. and Dr. J.G. Disch. "Predictive Analysis of a Battery of Anthropometric and Motor Performance Tests for Classification of Male Volleyball Players," unpublished research paper, Canadian Volleyball Association, Ottawa, 1979.

Disch and Field in Disch, C.F. and J.G. Disch. "Predictive Analysis of a Battery of Anthropometric and Motor Performance Tests for Classification of Male Volleyball Players," unpublished research paper, Canadian Volleyball Association, Ottawa, 1979.

Disch and Liskevych in Disch, C.F. and J.G. Disch. "Predictive Analysis of a Battery of Anthropometric and Motor Performance Tests for Classification of Male Volleyball Players," unpublished research paper, Canadian Volleyball Association, Ottawa, 1979.

Durnin, J.V. and J. Womersley. "Body Fat Assessed from Total Body Fat Density and It's Estimation from Skinfold: Measurement on 481 Men and Women Age from 16 to 72 Years," British Journal of Nutrition, 32: 77-96, 1974.

Eckert, Helen M. Practical Measurement of Physical Performance. Philadelphia: Lea and Febiger, 1974.

Fleischman, in Eckert, H.M. Practical Measurement of Physical Performance. Philadelphia: Lea and Febiger, 1974.

Espenschade, Anna S. "Restudy of Relationships: Between Physical Performances of School Children and Age, Height, and Weight," Research Quarterly, 34: 144-153, 1963.

Fawcett, Sandra A. "Validity of Volleyball Tests," New Zealand Journal of Health, Physical Education, and Recreation, 7: 14-18, 1974.

French, Ester and Bernice Cooper. "Achievement Tests in Volleyball for High School Girls," Research Quarterly, 8: 150-157, 1937.

Garn, S.M. in Conger, P. and R. Macnab. "Strenth, Body Composition and Work Capacity of Participants and Non-Participants in Women's Intercollegiate Sports," Research Quarterly, 38: 184-191, 1967.

Garn and Gorman in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall Inc., 1976.

Gerber, Ellen et al. The American Women In Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Gladden, L. Bruce and Dennis Colacino. "Characteristics of Volleyball Players and Success in a National Tournament," Journal of Sports Medicine, 18: 57-64, 1978.

Harris, M. in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall Inc., 1976.

Hebbelinck, Marcel and Johan Postma. "Anthropometric Measurements, Somatotype Ratings and Certain Motor Fitness Tests of Physical Education Majors in South Africa," Research Quarterly, 34: 327-334, 1963.

Hirata, K. in Gerber, Ellen et al. The American Women in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Holland, G. in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. Prentice-Hall, Inc., 1976.

Hosler, W.W. and James R. Morrow and Andrew S. Jackson. "Strength, Anthropometric and Speed Characteristics of College Women Volleyball Players," Research Quarterly, 49: 385-388, 1978.

Irata and Kadusa in Gerber, Ellen et al. The American Woman in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Jackson et al. in Disch, C.F. and Dr. J.G. Disch. "Predictive Analysis of a Battery of Anthropometric and Motor Performance Tests For Classification of Male Volleyball Players," unpublished paper, Canadian Volleyball Association, Ottawa, 1979.

Jackson, Patricia L. A Rating Scale for Discriminating Relative Playing Performance of Skilled Female Volleyball Players. Unpublished M.A. dissertation, University of Alberta, Edmonton, 1967.

Jarosinska, A. and A. Janusz. "Change in the Proportions of Factors of Body Build in 15-17 year old Girls as a Result of Volleyball Training," Wychowania Fizyczne i Sport Studia i Materialy, 22: 63-72, 1978.

Johnson, Barry L. and Jack K. Nelson. Practical Measurements for Evaluation in Physical Education. 3rd ed. Minneapolis: Burgess Publishing Co., 1979.

Khosla, in Gerber, Ellen et al. The American Women in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Klafs, Carl E. and Joan Lyon. The Female Athlete. Saint Louis: C.V. Mosby Company, 1973.

Krakower, Hyman. "Skeletal Symmetry and High Jumping," Research Quarterly, 12: 218-227, 1941.

Krakower, Hyman. "Testing in Physical Education," Research Quarterly, 8: 54-67, 1937.

Kronquist, Roger A. and Wayne B. Bramach. "A Modification of the Brady Volleyball Skill Test for High School Boys," Research Quarterly, 39: 116-120, 1968.

Lacka-Mierzejewska, T. "Body Build As An Element of Selection and Adaptation in Volleyball," Wychowanie Fizyczne i Sport Studia i Materialy, 22: 3-22, 1978.

Lamp, Nancy A. "Volleyball Skills of Junior High School Students as a Function of Physical Size and Maturity," Research Quarterly, 25: 189-200, 1954.

Lamp in Mohr, D. and M.J. Haverstick. "Relationship Between Height Jumping Ability and Agility to Volleyball Skill," Research Quarterly, 27: 74-78, 1956.

Larson, Leonard A. Fitness, Health and Work Capacity: International Standards for Assessment. New York: MacMillan Publishing Co. Inc., 1974.

Leighton, J.R. in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall Inc., 1976.

Liba, Marie R. and Marilyn R. Stauff. "A Test for the Volleyball Pass," Research Quarterly, 34: 56-63, 1963.

Malina, Robert M., et al. "Physique of Female Track and Field Athletes," Medicine and Science in Sports, 3: 32-38, 1971.

Martin, in Martiny, G. Scientific Approach to Modern Volleyball, Scarborough, Ontario: Canadian Volleyball Association Publications, 1972.

Martiny, G. Scientific Approach to International Volleyball. Scarborough, Ontario: Canadian Volleyball Association Publications, 1972.

Mathews, Donald K. Measurement In Physical Education, 4th ed. Philadelphia: W.B. Saunders Co., 1973.

Mayer, J. in Clarke H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall, Inc., 1976.

McArdle, W.D. in Gerber, Ellen et al. The American Women in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

McCue, B.F. in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-Hall, Inc., 1976.

Medved, Radovan. "Body Height and Predisposition for Certain Sports," Journal of Sports Medicine and Physical Fitness, 6: 89-91, 1966.

Mohr, Dorothy R. and Martha Haverstick. "Relationship Between Height, Jumping Ability and Agility to Volleyball Skill," Research Quarterly, 27: 74-78, 1956.

Mohr, Dorothy and Martha Haverstick. "Repeated Volleys Test for Womens' Volleyball," Research Quarterly, 26: 179-184, 1955.

Montoye, Henry J. An Introduction to Measurement in Physical Education. Boston: Allyn and Bacon, Inc., 1978.

Morrow, James et al. "The Importance of Strength, Speed and Body Size for Team Success in Women's Intercollegiate Volleyball," Research Quarterly, 50: 429-437, 1979.

Morris, P.C. in Gerber, Ellen et al. The American Women in Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Odgers, T.W. in Clarke, H. Application of Measurement to Health and Physical Education, 5th ed. New Jersey: Prentice-hall Inc., 1976.

Oyster, Nancy and Edna P. Wooten. "The Influence of Selected Anthropometric Measurements on the Ability of College Women to Perform the 35 Yard Dash," Medicine and Science In Sports, 3: 130-134, 1971.

Pierson, W.R. "Body Size and Speed," Research Quarterly, 32: 197-200, 1961.

Pilardieu, P. et al. "Height and Choice of a Sport," Medicine Sport, 52: 25-27, 1978.

Plowman, Sharon. "Physiological Characteristics of Female Athletes," Research Quarterly, 45: 349-363, 1974.

Pool, et al. in Gerber, Ellen et al. The American Women In Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Rash, Judy. "Volleyball Performance Assessment: An Overview and Analysis of the Literature," Canadian Volleyball Association Technical Bullertin, 23: 1-20, 1979.

Rea, Kent and Louis Del Rio. "A Quick Fitness Test for Determining Volleyball Ability," Journal of Physical Education, 77; 70, 1980.

Russell, Naomi and Elizabeth Lange. "Achievement Tests in Volleyball for Junior High School Girls," Research Quarterly, 11: 33-41, 1940.

Safrit, Margaret J. Evaluation in Physical Education. Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1973.

Sandefur, Randy. Volleyball. Pacific Palisades, California: Goodyear Publishing Company Inc., 1970.

Sawula, Lorne. "C.V.A. Evaluation Form for National Tryouts," unpublished article, Canadian Volleyball Association, Ottawa, 1979.

Sawula, Lorne. "Volleyball Index," Canadian Volleyball Association Technical Bulletin, 26: 1-13, 1979.

Shay, Clayton. Skills Test Manual - Volleyball. Washington, D.C.: AAHPER, 1969.

Shondell, Donald and Jerre McManama. Volleyball. Englewood Cliffs, New Jersey: Prentice-hall, Inc., 1971.

Sills, in Johnson, B.L. and J.K. Nelson. Practical Measurement for Evaluation in Physical Education, 3rd Ed. Minneapolis: Burgess Publishing Co., 1979.

Sinning, Wayne E. and Gary D. Lindberg. "Physical Characteristics of College Age Women Gymnasts," Research Quarterly, 43: 226-234, 1972.

Sinning, Wayne E. "Anthropometric Estimation of Body Density, Fat and Lean Body Weight in Women Gymnasts," Medicine and Science for Sports, 10: 243-249, 1978.

Slaymaker, Thomas and Virginia H. Brown. Power Volleyball. Toronto: W.B. Saunders Company, 1976.

Sprynarova, S. and J. Pariskova in Gerber, Ellen et al. The American Women In Sport. Don Mills, Ontario: Addison-Wesley Publishing Co., 1974.

Start, K.B. et al. "A Factorial Investigation of Power, Speed, Isometric Strength, and Anthropometric Measures in the Lower Limb," Research Quarterly, 37: 553-559, 1966.

Thorsen, Magaret A. "Body Structure and Design: Factors in the Motor Performance of College Women," Research Quarterly, 35: 418-432, 1964.

Toyoda, H. "The Lists of Physical Performances of Volleyball Players," Canadian Volleyball Association Technical Journal, 1: 17-32, 1974.

Trotter, Betty Jane. Volleyball for Girls and Women. New York: Ronald Press Co., 1965.

Ward, Paul E. and James Disch. "The Use of Performance Profiles in Athletics," United States Sports Academy News, 2: 2-4, 1978.

Wartenweiler, J. and A. Hess and B. Wijest in Larson, Leonard A. Fitness Health and Work Capacity: International Standards for Assessment. New York: MacMillan Publishing Co. Inc., 1974.

APPENDIX A
PERSONAL MEASUREMENT SHEET

PERSONAL MEASUREMENT SHEET

1. NAME _____
2. ADDRESS _____
3. AGE _____ 4. WEIGHT _____

LENGTHS

- | | | |
|----------------------|-------|----|
| 1. HEIGHT | _____ | CM |
| 2. ARM SPAN | _____ | CM |
| 3. FOOTLENGTH | _____ | CM |
| 4. LEG LENGTH | _____ | CM |
| 5. LOWER LEG LENGTH | _____ | CM |
| 6. UPPER LEG LENGTH | _____ | CM |
| 7. TRUNK LENGTH | _____ | CM |
| 8. ARM LENGTH | _____ | CM |
| 9. UPPER ARM LENGTH | _____ | CM |
| 10. LOWER ARM LENGTH | _____ | CM |
| 11. HAND LENGTH | _____ | CM |
| 12. HAND LENGTH | _____ | CM |
| 13. STAND & REACH | _____ | CM |

DIAMETERS

- | | | |
|--------------|-------|----|
| 1. SHOULDER | _____ | CM |
| 2. CHEST | _____ | CM |
| 3. BI-ILIAC | _____ | CM |
| 4. KNEE | _____ | CM |
| 5. ANKLE | _____ | CM |
| 6. WRIST | _____ | CM |
| 7. FT. WIDTH | _____ | CM |

POWER TESTS

- | | | |
|------------------|---------------------|----------|
| 1. SPIKE JUMP | _____, _____, _____ | CM |
| 2. SHUTTLE | _____ SEC, _____ | SEC |
| 3. PUSH-UPS | _____ | # |
| 4. BLOCK JUMP | _____, _____, _____ | CM |
| 5. FLEXIBILITY | _____ | INCHES + |
| 6. BROAD JUMPS | _____, _____ | CM |
| 7. GRIP STRENGTH | _____, _____ | KG |
| 8. VERTICAL JUMP | _____ | CM |

GIRTHS

- | | | |
|--------------|-------|----|
| 1. CALF | _____ | CM |
| 2. THIGH | _____ | CM |
| 3. ABDOMINAL | _____ | CM |
| 4. HIPS | _____ | CM |
| 5. CHEST | _____ | CM |
| 6. BICEPS | _____ | CM |
| 7. FOREARM | _____ | CM |
| 8. ANKLE | _____ | CM |

SKILL TESTS

- | | |
|-----------|-----------------------------|
| 1. VOLLEY | _____ |
| 2. SERVES | _____, _____, _____, _____, |
| | _____, _____, _____, _____, |

SKINFOLDS

- | | | |
|-------------------|--------------|----|
| 1. BICEPS | _____, _____ | MM |
| 2. TRICEPS | _____, _____ | MM |
| 3. SUB-SCAPULAR | _____, _____ | MM |
| 4. SUPRA-ILIAC | _____, _____ | MM |
| 5. TOTAL SKINFOLD | _____ | MM |
| 6. BODY FAT | _____ % | |

other side for questionnaire

1. What position do you most regularly play?
2. How often do you start and how frequently do you play?
3. What level do you participate in?
4. How many years have you played and been exposed to volleyball?
5. On a scale of 1 to 10 (1 inferior - 10 superior) rate yourself on volleyball ability. Compare with the Canadian population. Write a specific number.

/	/	/	/	/	/	/	/	/	/
1	2	3	4	5	6	7	8	9	10

6. On a scale of 1 to 10 (1 inferior - 10 superior) rate yourself on general athletic ability. Compare with the Canada population. Write a specific number.

/	/	/	/	/	/	/	/	/	/
1	2	3	4	5	6	7	8	9	10

APPENDIX B

ANTHROPOMETRIC TESTING PROCEDURES

APPENDIX B

ANTHROPOMETRIC TESTING PROCEDURES

1. AGE - The subject recorded her age at the time of testing.
2. WEIGHT - A spring scale was used to measure each subject's weight. The spring scale was chosen on the basis of its accessibility and consistency between subjects. The scale was balanced after each weighing. Each subject was weighed in shorts and T-shirt to the nearest 1/2 pound. Pounds were later converted to kilograms for the analysis of data.
3. STANDING HEIGHT - The subject stood bare footed, stretched tall, with back of heels against the wall, as close to the wall chart as possible. The wall chart was measured off in centimeters. A clipboard was placed horizontally on top of her head, across to a proper reading on the chart. A reading to the nearest centimeter was recorded, to measure from the vertex of the subject's head to the floor.
4. ARM SPAN - The subject stood as close to the wall as possible, her back was against the wall and the arms were stretched horizontally along the wall chart for arm

span, which was measured off in centimeters. The subject pronated her forearms so the palms were flush against the wall, and the longest fingertip of one hand was placed against the zero mark of the chart (which was either against a wall, or against a clipboard held perpendicular to the wall). Once the subjects' arms were in place, a measurement was taken from the tip of the longest finger of one hand to the tip of the longest finger on the other hand. A reading was recorded to the nearest centimeter.

5. FOOT LENGTH - The subject stood barefooted, with weight evenly distributed. Using an anthropometer the subject's foot was measured from the tip of the distal toe to the most posterior part of the heel. Measurement was recorded to the nearest millimeter.

6. LOWER LEG LENGTH - The subject was seated so the knees were positioned at approximately 90°, and the bare feet were flat on the floor. The subject's patella was palpated, and a measurement was taken from the lower border of the patella (lateral side) down to the floor. The measurement was taken to the nearest millimeter.

7. ARM LENGTH - The subject was required to roll up her sleeves and hang her arm loosely to the side. Using the metal tape, the measurement was taken from the acromion process (lateral) to the distal end of the longest finger. The measurement was calculated to the nearest millimeter.

8. LOWER ARM LENGTH - The subject, with a bare arm, flexed and supinated her arm. Using the metal tape the measurement was taken from the olecranon process to the distal end of the longest outstretched finger. The measurement was taken to the nearest millimeter.

9. HAND LENGTH - The metal tape was placed on a flat surface and the subject was asked to place the distal end of her longest finger on the zero mark. Her hand was placed along the tape. The base of the subject's thumb was located on the mark where the hand ended. Hand length was measured to the nearest millimeter.

10. LONGITUDINAL ARCH LENGTH - The subject stepped on a piece of brownish paper with a wet bare foot. The foot could not be too wet or too dry. The imprint left by the wet foot was outlined in pencil. The following calculations were drawn from the foot: Line A was

drawn between the medial imprint of the first metatarsal bone to the medial side of the imprint of the calcaneus. Line B was drawn between where line A first touches the metatarsal imprint to the point just touching the edge of the imprint on the inside of the arch. No paper should show between line B and the footprint. The angle between line A and line B was measured with a protractor to the nearest 1/2 degree.

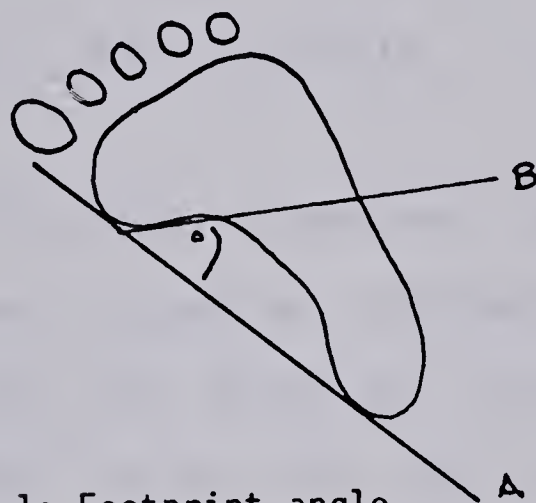


Figure 1: Footprint angle

11. FOOT WIDTH - The subject's imprint on paper was also used to find the foot width. Both lines A and B were used to calculate foot width. Another line C was drawn from the lateral border of the foot print to the most lateral border of the anterior part of the foot. The location where Line C first touches the most outer portion, was labelled point D. A line was then drawn between point D and point E (see description of foot length). The line between D and E was measured with a

ruler. The measurement was made to the nearest millimeter.

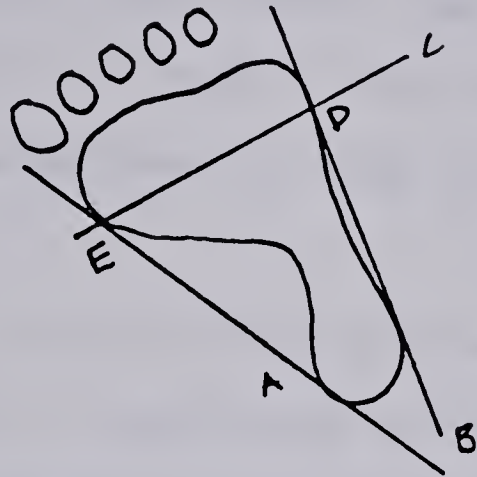


Figure 2: Width Calculation

12. STAND AND REACH - The subject, barefooted, stood side by the wall, as close as possible, stretched her arm straight up high along the height wall chart. Measurement was recorded from the most distal end of the longest outstretched finger to the floor, and recorded to the nearest centimeter.

13. CALF GIRTH - The subject stood with weight evenly distributed. A Gulick tape was used to measure the calf girth, on a horizontal plane at the subject's widest girth. Two or three locations were tested to ensure measuring the widest circumference. The circumference was measured to the nearest millimeter.

14. THIGH GIRTH - The subject stood weight evenly distributed, while the maximum horizontal circumference of her thigh was measured using a Gulick tape. Again several measurements were taken to find the maximum circumference. The measurement was taken to the nearest millimeter.

15. ABDOMINAL GIRTH - In the standing position the subject lowered her shorts. A measurement with the Gulick tape, was taken approximately two inches below the umbilicus. No clothing was caught under the tape. The measurement was taken to the nearest millimeter.

16. BI-ILIAC GIRTH - The subject stood, weight evenly distributed, feet together, and the Gulick tape was pulled around the hips, over her shorts. The shorts were pulled tight with no wrinkles or bulges. The measurement was taken on the horizontal plane from the point of maximum protrusion of the buttocks to the symphysis pubis. The Gulick tape was used for the measurement and the measurement was recorded to the nearest millimeter.

17. CHEST GIRTH - The subject was measured in a standing position with her shirt on. Just prior to the actual measurement, the subject exhaled maximally and let her arms hang

loosely at her sides. The Gulick tape was used to measure the subject's maximum circumference, which was found on the horizontal plane around the nipple line. The shirt was pulled tightly so that no wrinkles appeared under the tape. The chest circumference was measured to the nearest millimeter.

18. BICEPS GIRTH - The subject was requested to roll up her sleeve, flex her arm to approximately 70° - 90° and contract her biceps maximally at the time of the measurement. The measurement was taken around the arm at the biceps. Several measurements with the Gulick tape were taken to locate the maximum circumference. The measurement was recorded to the nearest millimeter.

19. FOREARM GIRTH - The subject, bare armed, was instructed to slightly flex the arm and maximally contract the forearm at the time of measurement. Using the Gulick tape, the subject's forearm was measured at its point of maximal circumference. Several measurements were taken to locate the maximum circumference which was measured to the nearest millimeter.

20. ANKLE GIRTH - The bare ankled subject was required to sit down with the knee and ankle at approximately 90° . The

subject was measured on the horizontal plane, around the lateral and medial malleolus. The measurement was taken with a Gulick tape and recorded to the nearest millimeter.

21. SHOULDER DIAMETER - The subject stood upright but relaxed with good posture. The test was administered from behind the subject, with an anthropometer. The measurement was taken from the left acromion process to the right acromion process. The anthropometer was pressed as close to the bone as possible, over the T-shirt. The measurement was taken to the nearest millimeter.

22. CHEST DIAMETER - The subject stood upright but relaxed, with the arms hanging loosely at the sides. A shirt was worn. The test was administered just at the point of maximum exhalation. Using an anthropometer, a measurement was taken in line with the nipples. The anthropometer was pressed tightly against the sides of the body, while the measurement was recorded to the nearest millimeter.

23. BI-ILIAC DIAMETER - The subject, in shorts, was measured in a standing position, from the front. The subject's weight was evenly distributed. Measurement was taken

with an anthropometer, from the lateral margin of the right iliac crest to the lateral margin of the left iliac crest. The iliac crest was palpated and the ends of the anthropometer were pressed as closely as possible to the bone. The bi-iliac diameter was measured to the nearest millimeter.

24. KNEE DIAMETER - The subject was seated, with the feet flat on the floor and the knees bent at an approximate 90° angle. The bare knee was measured from the front using an anthropometer. The anthropometer was held on the horizontal while pressed tightly against the sides of the knee. The measurement from the lateral condyle of the femur to the medial condyle of the femur was recorded to the nearest millimeter.

25. ANKLE DIAMETER - The subject remained seated with the knees and ankles bent at approximately 90°. The subject was without socks and shoes. One arm of the anthropometer was placed against the medial maleolus, while the other arm was pressed tightly against the lateral maleolus. The measurement was taken from the front and recorded to the nearest millimeter.

26. WRIST DIAMETER - The subject held the dominant hand out in front

of the body and supinated the forearm. The wrist diameter was measured with the anthropometer from the posterior side. The measurement was recorded with the arms of the anthropometer pressed tightly against the medial and lateral styloid processes of the radius and ulna. The measurement was recorded to the nearest millimeter.

27. BICEPS SKINFOLD MEASUREMENT - The subject was required to stand up with sleeves rolled up and arms hanging relaxed at sides. One to one and a half inches of skin and fat was pinched off on the longitudinal line of the arm, half-way between the elbow and the olecranon process. The pinched off portion did not include any of the subject's muscle. The two "pinchers" of the skin caliper were placed approximately where the index finger and the thumb pulled away the skin fold. A reading was taken from the skin caliper, three seconds after the caliper grasped the fold. Once the first measurement was obtained, a second measurement was taken from the same location. Measurements were continued until two readings were obtained that did not vary by more than three millimeters. These two readings were averaged for the bicep skinfold score. Each skin fold measurement was recorded to the nearest

millimeter and averaged.

28. TRICEPS SKINFOLD MEASUREMENT - The subject assumed the same position as for the biceps skinfold measurement. The measuring methods and procedures for the skin fold tests were quite similar, only the location of the testing changed. The triceps skinfold was measured at the midpoint between the olecranon process and the acromion process. The measurement was taken on the longitudinal line from the posterior side of the arm. A reading was taken from the skin caliper, three seconds after the caliper grasped the fold. Once the first measurement was obtained, a second measurement was taken from the same location. Measurements were continued until two readings were obtained that did not vary more than three millimeters. These two readings were averaged for the triceps skinfold score. Each skin fold measurement was recorded to the nearest millimeter and averaged.

29. SUB-SCAPULAR SKINFOLD MEASUREMENT - The subject assumed the same body position as the biceps and triceps skin fold measurements. The subject's shirt was lifted up and out of the way of the measurement. To measure the sub-scapular skinfold, the subject was pinched just below the scapula and parallel to the inferior angle

and lower auxilliary border. The skinfold was pinched at a 45° angle to vertical. A reading was taken from the skin caliper, three seconds after the caliper grasped the fold. Once the first measurement was obtained, a second measurement was taken from the same location. Measurements were continued until two readings were obtained that did not vary more than three millimeters. These two readings were averaged for the sub-scapular skinfold score. Each skin fold measurement was recorded to the nearest millimeter and averaged.

30. SUPRA-ILIAC SKINFOLD MEASUREMENT

The subject assumed the identical body position as for the other three skin fold measurements. The subject was requested to pull the shorts down to below the iliac crest. The same methods were followed as the other three skin fold tests, except a skin fold was grasped just above and parallel to the iliac crest at about the mid-axillary line. A reading was taken from the skin caliper, three seconds after the caliper grasped the fold. Once the first measurement was obtained, a second measurement was taken from the same location. Measurements were continued until two readings were obtained that did not vary more than

three millimeters. These two readings were averaged for the supra-iliac skinfold score. Each skinfold measurement was recorded to the nearest millimeter and averaged.

ANTHROPOMETRIC CALCULATIONS

1. TRUNK LENGTH or SITTING HEIGHT - The subject sat on a table, with back flush against the wall, as in the height measurement. The same chart and the same procedure was used as for the standing height test. Measurement was taken from the vertex to the floor, and recorded to the nearest centimeter. The height of the table was then subtracted from the total height.
2. TOTAL LEG LENGTH - To determine the total leg length, the subject's sitting height was subtracted from the standing height. This calculation was recorded to the nearest centimeter.
3. UPPER LEG LENGTH - The subject's upper leg length was calculated by subtracting the lower leg length from the total leg length. The measurement was calculated to the nearest millimeter.
4. UPPER ARM LENGTH - The subject's upper arm length was calculated by subtracting the lower arm length from the total arm length. The upper arm measurement was recorded to the nearest millimeter.

5. TOTAL SKINFOLD - Each subject's skinfold measures were totaled and compared to Durnin and Womersley's (1974) chart on estimation of body fat through skinfold measures. (See Table VII).

6. FAT PERCENTAGE - Each subject's total body fat percentage was calculated by the use of Durnin's body fat chart. The percentage of body fat was estimated by the total number of millimeters of skinfold that was pinched off. See following Table VII.

TABLE VI The equivalent fat content, as a percentage of body-weight, for a range of values for the sum of four skinfolds (biceps, triceps, subscapular and supra-iliac) of males and females of different ages.

Skinfolds (mm)	Males (age in years)				Females (age in years)			
	17-29	30-39	40-49	50+	16-29	30-39	40-49	50+
15	4.8	—	—	—	10.5	—	—	—
20	8.1	12.2	12.2	12.6	14.1	17.0	19.8	21.4
25	10.5	14.2	15.0	15.6	16.8	19.4	22.2	24.0
30	12.9	16.2	17.7	18.6	19.5	21.8	24.5	26.6
35	14.7	17.7	19.6	20.8	21.5	23.7	26.4	28.5
40	16.4	19.2	21.4	22.9	23.4	25.5	28.2	30.3
45	17.7	20.4	23.0	24.7	25.0	26.9	29.6	31.9
50	19.0	21.5	24.6	26.5	26.5	28.2	31.0	33.4
55	20.1	22.5	25.9	27.9	27.8	29.4	32.1	34.6
60	21.2	23.5	27.1	29.2	29.1	30.6	33.2	35.7
65	22.2	24.3	18.2	30.4	30.2	31.6	34.1	36.7
70	23.1	25.1	29.3	31.6	31.2	32.5	35.0	37.7
75	24.0	25.9	30.3	32.7	32.2	33.4	35.9	38.7
80	24.8	26.6	31.2	33.8	33.1	34.3	36.7	39.6
85	25.5	27.2	32.1	34.8	34.0	35.1	37.5	40.4
90	26.2	27.8	33.0	35.8	34.8	35.8	38.3	41.2
95	26.9	28.4	33.7	36.6	35.0	36.5	39.0	41.9
100	27.6	29.0	34.4	37.4	36.4	37.2	39.7	42.6
105	28.2	29.6	35.1	38.2	37.1	37.9	40.4	43.3
110	28.8	30.1	35.8	39.0	37.8	38.6	41.0	43.9
115	29.4	30.6	36.4	39.7	38.4	39.1	41.5	44.5
120	30.0	31.1	37.0	40.4	39.0	39.6	42.0	45.1
125	30.5	31.5	37.6	41.1	39.6	40.1	42.5	45.7
130	31.0	31.9	38.2	41.8	40.2	40.6	43.0	46.2
135	31.5	32.3	38.7	42.4	40.8	41.1	43.5	46.7
140	32.0	32.7	39.2	43.0	41.3	41.6	44.0	47.2
145	32.5	33.1	39.7	43.6	41.8	42.1	44.5	47.7
150	32.9	33.5	40.2	44.1	42.3	42.6	45.0	48.2
155	33.3	33.9	40.7	44.6	42.8	43.1	45.4	48.7
160	33.7	34.3	41.2	45.1	43.3	43.6	45.8	49.2
165	34.1	34.6	41.6	45.6	43.7	44.0	46.2	49.6
170	34.5	34.8	42.0	46.1	44.1	44.4	46.6	50.0
175	34.9	—	—	—	—	44.8	47.0	50.4
180	35.3	—	—	—	—	45.2	47.4	50.8
185	35.6	—	—	—	—	45.6	47.8	51.2
190	35.9	—	—	—	—	45.9	48.2	51.6
195	—	—	—	—	—	46.2	48.5	52.0
200	—	—	—	—	—	46.5	48.8	51.6
205	—	—	—	—	—	—	49.1	52.7
210	—	—	—	—	—	—	49.2	53.0

In two thirds of the instances the error was within $\pm 3.5\%$ of the body weight as fat for the women and $\pm 5\%$ for the men.

APPENDIX C

MEANS, T-TEST SCORES AND NATIONAL PLAYERS (GROUP 1)

COMPARED TO CANADIAN NON-NATIONAL PLAYERS (GROUP 2)

T TEST BETWEEN VARIABLES FOR VARIOUS TESTS

TEST PROCEDURE

VARIABLE: SN SUBJECT NUMBER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	19.15340615	12.94114847	3.58923389	1.00000000	37.00000000	UNEQUAL	-0.6326	21.5	0.5337
2	28	21.42142857	11.71277736	2.21350686	4.00000000	41.00000000	EQUAL	-0.6567	39.0	0.5153

FOR H0: VARIANCES ARE EQUAL, F= 1.22 WITH 12 AND 21 DF PROB > F= 0.6389

VARIABLE: AG AGE

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	19.07642308	1.84668796	0.51217909	17.00000000	23.00000000	UNEQUAL	-1.4093	27.2	0.1701
2	28	20.00000000	2.16724690	0.40824829	14.00000000	28.00000000	EQUAL	-1.3234	39.0	0.1914

FOR H0: VARIANCES ARE EQUAL, F= 1.37 WITH 27 AND 12 DF PROB > F= 0.5797

VARIABLE: WT WEIGHT (IN KILOGRAMS)

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	71.39230769	6.30904426	1.74981543	62.70000000	84.50000000	UNEQUAL	3.2617	25.9	0.0031
2	28	64.23214286	7.01448520	1.32561310	53.60000000	88.20000000	EQUAL	3.1350	39.0	0.0033

FOR H0: VARIANCES ARE EQUAL, F= 1.24 WITH 27 AND 12 DF PROB > F= 0.7213

VARIABLE: HT HEIGHT (IN CENTIMETRES)

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	176.45454545	4.44597250	1.47317614	171.00000000	185.00000000	UNEQUAL	1.9609	25.2	0.0610
2	22	172.54545455	6.24986601	1.34313595	161.00000000	185.00000000	EQUAL	1.8000	31.0	0.0816

FOR H0: VARIANCES ARE EQUAL, F= 1.66 WITH 21 AND 10 DF PROB > F= 0.4097

VARIABLE: ASP ARM SPAN

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	180.08333333	3.72847357	1.07631761	175.00000000	186.00000000	UNEQUAL	4.4794	34.9	0.0001
2	24	172.67857143	6.51912964	1.25467757	161.00000000	187.00000000	EQUAL	3.6099	38.0	0.0009

FOR H0: VARIANCES ARE EQUAL, F= 3.17 WITH 27 AND 11 DF PROB > F= 0.0443

THE TEST PROCEDURE

VARIABLE: PL										
PLXIBILITY										
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	18.70833333	8.63881275	2.43677541	1.50000000	29.40000000	UNEQUAL	1.1853	20.5	0.2498
2	27	15.27807407	8.15001617	1.56847134	0.20000000	26.40000000	EQUAL	1.2017	37.0	0.2371
FOR H0: VARIANCES ARE EQUAL, F' = 1.07 WITH 11 AND 26 DF PROB > F' = 0.8377										

VARIABLE: TL									
TRUNK LENGTH									
IX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF
1	12	94.1333333	3.87514348	1.00320194	84.50000000	99.50000000	UNWEIGHTED	3.0456	26.3
2	22	90.0681818	6.12772804	0.88046098	79.00000000	96.00000000	EQUAL	2.4919	32.0

FOR H0: VARIANCES ARE EQUAL, F = 1.81 WITH 21 AND 11 DF P = 0.5639

VARIABLE: LL										
TOTAL LEG LENGTH										
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	82.2585585	7.50191891	2.26191245	70.50000000	97.50000000	UNEQUAL	0.0574	13.7	0.9551
2	22	82.11363636	8.44320073	0.95795361	71.00000000	91.00000000	EQUAL	0.0676	31.0	0.9465
FOR H0: VARIANCES ARE EQUAL, F' = 2.74 WITH 10 AND 21 DF										
PROB > F' = 0.0459										

VARIABLE: LLL									
LOWER LEG LENGTH									
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF
1	12	48.75000000	2.06155281	0.59511904	45.00000000	52.00000000	UNEQUAL	1.6695	27.7
2	28	47.42857143	2.76122050	0.52132162	41.00000000	52.00000000	EQUAL	1.4854	38.0
FOR H0: VARIANCES ARE EQUAL, F = 1.79 WITH 27 AND 11 DF PROB > F = 0.3091									

VARIABLE: ULL										
UPPER LEG LENGTH										
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	33.50545455	7.45638131	2.36478804	20.50000000	51.50000000	UNEQUAL	-0.6486	11.9	0.5243
2	22	45.75000000	4.47264434	0.91305873	30.00000000	60.50000000	EQUAL	-0.4784	31.0	0.3465

FOR H0: VARIANCES ARE EQUAL, P = 5.44 WITH 10 AND 21 DF

DOUB > F = 0.0011

T TEST BETWEEN VARIABLES FOR SMALL TESTS

TTEST PROCEDURE

VARIABLE: AL		TOTAL APN LENGTH											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T			
1	12	77.27500000	2.55276143	0.73691875	74.00000000	82.00000000	UNEQUAL	2.6707	24.6	0.0132			
2	28	74.78571429	3.01977609	0.57064404	69.00000000	81.00000000	EQUAL	2.4944	38.0	0.0171			

FOR H0: VARIANCES ARE EQUAL, F' = 1.40 WITH 27 AND 11 DF PROR > F' = 0.5707

VARIABLE: DAL											
UPPER APN LENGTH											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	12	30.75000000	1.81383571	0.52360927	24.00000000	34.50000000	UNEQUAL	2.4344	19.9	0.0245	
2	28	29.25000000	1.71863426	0.32479135	26.00000000	33.00000000	EQUAL	2.4889	38.0	0.0173	

FOR H0: VARIANCES ARE EQUAL, F' = 1.11 WITH 11 AND 27 DF PROR > F' = 0.7770

VARIABLE: LAL		LOWFR APN LENGTH											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T			
1	12	46.62500000	1.02524942	0.29595401	45.00000000	48.00000000	UNEQUAL	2.4552	35.2	0.0192			
2	28	45.50000000	1.45042569	0.26979208	42.00000000	50.00000000	EQUAL	1.9703	38.0	0.0561			

FOR H0: VARIANCES ARE EQUAL, F' = 3.26 WITH 27 AND 11 DF PROR > F' = 0.0836

VARIABLE: HL											
HAND LENGTH											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	12	18.79166667	0.86493125	0.24968414	17.50000000	20.00000000	UNEQUAL	2.6576	30.0	0.0125	
2	28	17.87500000	1.25422522	0.23797120	15.00000000	20.00000000	EQUAL	2.2923	38.0	0.0275	

FOR H0: VARIANCES ARE EQUAL, F' = 2.12 WITH 27 AND 11 DF PROR > F' = 0.1404

VARIABLE: ARCH		LONGITUDINAL ARCH LENGTH (IN DEGREES)									
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	12	45.29166667	14.72236754	4.24998143	21.00000000	68.00000000	UNEQUAL	-0.3581	15.8	0.7250	
2	28	46.46424571	10.24504443	1.93613791	15.00000000	62.00000000	EQUAL	-0.4137	39.0	0.5814	

FOR H0: VARIANCES ARE EQUAL, F' = 2.07 WITH 11 AND 27 DF PROR > F' = 0.1224

TEST PROCEDURE

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	227.45454545	6.10513941	1.84076879	216.00000000	236.00000000	UNEQUAL	3.0740	26.2	0.0049
2	22	219.63636364	8.23202489	1.75507360	205.00000000	234.00000000	EQUAL	2.7817	31.0	0.0091

FOR H0: VARIANCES ARE EQUAL, F' = 1.82 WITH 21 AND 10 DF PROB > F' = 0.3300

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	36.45833333	1.54542127	0.45767170	34.10000000	40.00000000	UNEQUAL	1.4667	29.2	0.1531
2	28	36.04285714	2.24572442	0.42440212	31.90000000	42.00000000	EQUAL	1.2779	38.0	0.2090

FOR H0: VARIANCES ARE EQUAL, F' = 2.01 WITH 27 AND 11 DF PROB > F' = 0.2249

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	60.35000000	3.46816642	1.03117355	56.20000000	66.50000000	UNEQUAL	1.5876	30.5	0.1227
2	28	58.13571429	5.13825264	0.97103848	39.80000000	71.10000000	EQUAL	1.3608	38.0	0.1816

FOR H0: VARIANCES ARE EQUAL, F' = 2.19 WITH 27 AND 11 DF PROB > F' = 0.1713

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	87.00813333	5.75712339	1.66193837	74.00000000	97.40000000	UNEQUAL	2.6810	17.8	0.0153
2	28	81.49571429	4.78533363	0.90434305	73.40000000	93.00000000	EQUAL	2.8908	38.0	0.0053

FOR H0: VARIANCES ARE EQUAL, F' = 1.45 WITH 11 AND 27 DF PROB > F' = 0.4183

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	100.4500000	4.21609470	1.21708171	95.00000000	104.50000000	UNEQUAL	1.3201	21.4	0.2008
2	28	98.51428571	4.32749301	0.81781931	90.70000000	109.70000000	EQUAL	1.3061	38.0	0.1994

FOR H0: VARIANCES ARE EQUAL, F' = 1.05 WITH 27 AND 11 DF PROB > F' = 0.4763

T TEST BETWEEN VARIABLES FOR VBALL TPTS

TTEST PROCEDURE

VARIABLE: CHD CHEST DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	24.19166667	1.08582864	0.31345057	26.40000000	30.20000000	UNEQUAL	5.1634	27.1	0.0001
2	28	26.06071429	1.42057351	0.26846316	24.00000000	29.00000000	EQUAL	4.6355	38.0	0.0001

FOR H0: VARIANCES ARE EQUAL, F' = 1.71 WITH 27 AND 11 DF PROB > F' = 0.3505

VARIABLE: BILD BI-ILIAC DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	28.39166667	2.02684633	0.59510014	25.70000000	32.20000000	UNEQUAL	0.6820	15.7	0.5052
2	28	27.45357143	1.40250626	0.26504877	25.30000000	30.40000000	EQUAL	0.7895	38.0	0.3347

FOR H0: VARIANCES ARE EQUAL, F' = 2.09 WITH 11 AND 27 DF PROB > F' = 0.1167

VARIABLE: KND KNEE DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	9.27500000	0.55452683	0.16007811	8.50000000	10.30000000	UNEQUAL	3.2223	18.8	0.0045
2	28	8.67857143	0.44167676	0.09291817	7.80000000	9.90000000	EQUAL	3.3850	38.0	0.0017

FOR H0: VARIANCES ARE EQUAL, F' = 1.27 WITH 11 AND 27 DF PROB > F' = 0.5437

VARIABLE: ANKD ANKLE DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	6.79166667	0.31769236	0.10903039	6.00000000	7.30000000	UNEQUAL	3.1251	16.8	0.0063
2	28	6.41071429	0.28886886	0.05451549	6.00000000	7.10000000	EQUAL	3.4842	38.0	0.0013

FOR H0: VARIANCES ARE EQUAL, F' = 1.71 WITH 11 AND 27 DF PROB > F' = 0.2473

VARIABLE: WRD WRIST DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	5.45666667	0.28069179	0.08102874	5.00000000	5.90000000	UNEQUAL	4.1433	19.3	0.0005
2	28	5.07500000	0.25521845	0.04842083	4.50000000	5.60000000	EQUAL	4.3074	38.0	0.0001

FOR H0: VARIANCES ARE EQUAL, F' = 1.20 WITH 11 AND 27 DF PROB > F' = 0.6661

T TEST BETWEEN VARIABLES FOR SMALL TESTS

TTEST PROCEDURE

VARIABLE: BISK BICEPS SKINFOLD

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	7.79166667	2.60818932	0.75291940	4.50000000	11.40000000	UNEQUAL	0.7385	17.6	0.4700
2	24	7.16071429	2.13738145	0.40392713	4.40000000	13.40000000	EQUAL	0.3008	38.0	0.4282

FOR H0: VARIANCES ARE EQUAL, F= 1.49 WITH 11 AND 27 DF PROB > F= 0.3858

VARIABLE: TRISK TRICEPS SKINFOLD

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	14.75000000	3.01677130	0.87086686	10.60000000	19.70000000	UNEQUAL	-0.8048	22.6	0.4293
2	24	15.61071429	3.24490817	0.62078929	11.50000000	24.30000000	EQUAL	-0.7772	38.0	0.4418

FOR H0: VARIANCES ARE EQUAL, F= 1.19 WITH 27 AND 11 DF PROB > F= 0.7478

VARIABLE: SUBS SUBSCAPULAR SKINFOLD

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	11.40000000	2.70151473	0.77986013	4.00000000	19.00000000	UNEQUAL	0.1808	19.3	0.9584
2	24	11.63571429	2.46944994	0.46675777	8.10000000	17.50000000	EQUAL	0.1875	38.0	0.8522

FOR H0: VARIANCES ARE EQUAL, F= 1.20 WITH 11 AND 27 DF PROB > F= 0.6707

VARIABLE: SUPI SUPRA-ILIAC SKINFOLD

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	9.12500000	2.87574598	0.71468631	5.40000000	13.20000000	UNEQUAL	-0.4319	25.0	0.6695
2	24	9.51785714	2.97643072	0.56256813	5.00000000	19.00000000	EQUAL	-0.4008	38.0	0.5908

FOR H0: VARIANCES ARE EQUAL, F= 1.85 WITH 27 AND 11 DF PROB > F= 0.5305

VARIABLE: TOSK TOTAL SKINFOLD

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	43.47500000	4.06711401	2.32877667	24.60000000	55.70000000	UNEQUAL	-0.1587	21.6	0.8754
2	24	43.92142857	4.15548504	1.57913275	30.40000000	64.60000000	EQUAL	-0.1564	38.0	0.9766

FOR H0: VARIANCES ARE EQUAL, F= 1.07 WITH 27 AND 11 DF PROB > F= 0.4483

T TEST BETWEEN VARIABLES FOR VBALL TESTS
TEST PROCEDURE

VARIABLE: BODY PERCENTAGE BODY FAT

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	24.14166667	2.73477881	0.78946264	18.30080000	27.90000000	UNEQUAL	-0.1208	19.7	0.9051
2	28	24.25357143	2.56550941	0.48483571	19.50000000	30.10000000	EQUAL	-0.1240	38.0	0.9020

FOR H0: VARIANCES ARE EQUAL, P = 1.14 WITH 11 AND 27 DF PROB > P = 0.7469

VARIABLE: SPJ SPIKE JUMP

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	287.43333333	6.01241301	1.73569187	276.00000000	299.00000000	UNEQUAL	6.6606	30.7	0.0001
2	22	270.45454545	9.13771500	1.94816738	254.00000000	285.00000000	EQUAL	5.9064	32.0	0.0001

FOR H0: VARIANCES ARE EQUAL, P = 2.31 WITH 21 AND 11 DF PROB > P = 0.1534

VARIABLE: SH SHUTTLE RUN

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	14.22307692	0.59041489	0.16375163	13.20000000	14.90000000	UNEQUAL	-2.2032	18.6	0.0404
2	28	14.62857143	0.44460315	0.08402210	13.40000000	15.60000000	EQUAL	-2.4454	39.0	0.0191

FOR H0: VARIANCES ARE EQUAL, P = 1.76 WITH 12 AND 27 DF PROB > P = 0.2152

VARIABLE: PU PUSH-UPS

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	23.00000000	5.78349044	1.66954422	12.00000000	31.00000000	UNEQUAL	0.2814	31.1	0.7802
2	27	22.33333333	4.71102338	1.68028623	9.00000000	41.00000000	EQUAL	0.2411	37.0	0.8108

FOR H0: VARIANCES ARE EQUAL, P = 2.28 WITH 26 AND 11 DF PROB > P = 0.1533

VARIABLE: BL BLOCK JUMP

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	272.00000000	4.24264069	1.22474487	265.00000000	280.00000000	UNEQUAL	6.0300	31.3	0.0001
2	22	257.40909091	9.31457011	1.99013703	240.00000000	276.00000000	EQUAL	4.9324	32.0	0.0001

FOR H0: VARIANCES ARE EQUAL, P = 4.44 WITH 21 AND 11 DF PROB > P = 0.0049

T TEST BETWEEN VARIABLES FOR VBALL TESTS

TTEST PROCEDURE

VARIABLE: R3 BEST OF THREE SUCCESSIVE BROAD JUMPS

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	642.81181142	31.77048373	9.57916127	660.00000000	751.00000000	UNEQUAL	5.4153	23.7	0.0001
2	28	626.03571429	41.09433027	7.76645437	556.00000000	730.00000000	EQUAL	4.8371	37.0	0.0001

FOR H0: VARIANCES ARE EQUAL, F' = 1.67 WITH 27 AND 10 DF PROB > F' = 0.3965

VARIABLE: GP GRIP STRENGTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	41.23076923	4.24566148	1.17753462	34.00000000	49.00000000	UNEQUAL	1.9241	30.5	0.0637
2	28	38.17857143	5.62437533	1.06290703	21.00000000	49.00000000	EQUAL	1.7359	39.0	0.0905

FOR H0: VARIANCES ARE EQUAL, F' = 1.75 WITH 27 AND 12 DF PROB > F' = 0.3064

VARIABLE: V0 VOLLEY TEST SCORE

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	45.61538462	2.25604601	0.62571458	41.00000000	49.00000000	UNEQUAL	3.8492	31.8	0.0005
2	21	41.47614048	4.00773062	0.87455852	33.00000000	46.00000000	EQUAL	3.3933	32.0	0.0019

FOR H0: VARIANCES ARE EQUAL, F' = 3.16 WITH 20 AND 12 DF PROB > F' = 0.0451

VARIABLE: S2 SERVE TEST SCORE

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	13	23.24076923	5.41439223	1.50279162	13.00000000	32.00000000	UNEQUAL	0.0878	25.3	0.9307
2	17	23.05842353	5.1772378	1.25578247	14.00000000	33.00000000	EQUAL	0.0884	28.0	0.9302

FOR H0: VARIANCES ARE EQUAL, F' = 1.10 WITH 12 AND 16 DF PROB > F' = 0.8481

VARIABLE: POS POSITION USUALLY PLAYED

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	3.66666667	1.66964822	0.48199920	2.00000000	7.00000000	UNEQUAL	-1.8097	21.2	0.0846
2	24	4.71428571	1.64655736	0.32061920	2.00000000	7.00000000	EQUAL	-1.7919	34.0	0.0831

FOR H0: VARIANCES ARE EQUAL, F' = 1.03 WITH 27 AND 11 DF PROB > F' = 1.0000

T TEST BETWEEN VARIABLES FOR VBALL TESTS

TEST PROCEDURE

VARIABLE: ST STAPLES OR NOT?

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	4.66666667	0.49236596	0.14213381	4.00000000	5.00000000	UNEQUAL	1.7997	36.6	0.0801
2	24	4.25000000	0.46704973	0.09275522	2.00000000	5.00000000	EQUAL	1.4089	38.0	0.1670

FOR H0: VARIANCES ARE EQUAL, F' = 3.86 WITH 27 AND 11 DF PPOR > F' = 0.0226

VARIABLE: LEV LEVEL OF PLAY

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	7.00000000	0.73454895	0.21320072	5.00000000	8.00000000	UNEQUAL	5.8040	38.0	0.0001
2	28	4.75000000	1.71323422	0.32377159	2.00000000	6.00000000	EQUAL	4.3538	38.0	0.0001

FOR H0: VARIANCES ARE EQUAL, F' = 5.38 WITH 27 AND 11 DF PPOR > F' = 0.0056

VARIABLE: EXP YEARS OF EXPERIENCE

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	4.50000000	2.19503572	0.63365223	2.00000000	10.00000000	UNEQUAL	-2.4105	20.7	0.0253
2	28	6.32142857	2.17423529	0.41164774	3.00000000	13.00000000	EQUAL	-2.4181	38.0	0.0205

FOR H0: VARIANCES ARE EQUAL, F' = 1.02 WITH 11 AND 27 DF PPOR > F' = 0.9191

VARIABLE: VBAR SELF-EVALUATION OF VOLLEYBALL ABILITY

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	7.45833333	1.07573040	0.31053676	5.50000000	9.50000000	UNEQUAL	1.7511	19.6	0.0956
2	28	6.82142857	1.00194216	0.18935683	4.00000000	8.50000000	EQUAL	1.8029	38.0	0.0793

FOR H0: VARIANCES ARE EQUAL, F' = 1.15 WITH 11 AND 27 DF PPOR > F' = 0.7256

VARIABLE: GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	8.04166667	0.43424311	0.12419799	6.50000000	9.00000000	UNEQUAL	2.7591	23.2	0.0111
2	28	7.21428571	0.93718028	0.17711043	5.00000000	9.00000000	EQUAL	2.6362	38.0	0.0121

FOR H0: VARIANCES ARE EQUAL, F' = 1.25 WITH 27 AND 11 DF PPOR > F' = 0.7217

T TEST BETWEEN VARIANCES FOR VBALL TESTS

TTEST PROCEDURE

VARIABLE: VJMP VERTICAL JUMP

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	60.40409091	8.65445348	2.60926512	51.00000000	75.00000000	UNEQUAL	3.8333	12.2	0.0023
2	22	50.38636364	3.94979707	0.85275960	40.00000000	58.00000000	EQUAL	4.8169	31.0	0.0001

FOR H0: VARIANCES ARE EQUAL, P= 4.64 WITH 10 AND 21 DF PROB > P= 0.0028

VARIABLE: PTWD FOOT WIDTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	9.64166667	0.71663143	0.20687367	8.50000000	11.00000000	UNEQUAL	0.5474	17.1	0.5912
2	28	9.56428571	0.56385859	0.10655926	8.50000000	10.80000000	EQUAL	0.6032	38.0	0.5499

FOR H0: VARIANCES ARE EQUAL, P= 1.62 WITH 11 AND 27 DF PROB > P= 0.3010

VARIABLE: R1 UPPER ARM LENGTH/LOWER ARM LENGTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	0.65437274	0.03260324	0.00941175	0.54574468	0.72631579	UNEQUAL	1.4020	22.4	0.1746
2	28	0.64323331	0.03507190	0.00662797	0.57446404	0.70454545	EQUAL	1.3608	38.0	0.1816

FOR H0: VARIANCES ARE EQUAL, P= 1.16 WITH 27 AND 11 DF PROB > P= 0.8337

VARIABLE: R2 SHOULDER DIAMETER/CHEST DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.36781966	0.05617549	0.01621658	1.25496689	1.43478261	UNEQUAL	-1.9674	30.9	0.0582
2	28	1.31254404	0.08444964	0.01596705	1.24302784	1.55601660	EQUAL	-1.6773	38.0	0.1017

FOR H0: VARIANCES ARE EQUAL, P= 2.26 WITH 27 AND 11 DF PROB > P= 0.1558

VARIABLE: R3 SHOULDER DIAMETER/BI ILIAC DIAMETER

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.1611027	0.07643305	0.02220866	1.18804777	1.44805447	UNEQUAL	1.6766	21.2	0.1093
2	28	1.11666623	0.07418830	0.01477620	1.20265781	1.47509579	EQUAL	1.6655	38.0	0.1040

FOR H0: VARIANCES ARE EQUAL, P= 1.03 WITH 27 AND 11 DF PROB > P= 1.0000

T TEST BETWEEN VARIABLES FOR SMALL TESTS

TTEST PROCEDURE

VARIABLE: R4 CALP GIRTH/ANKLE GIRTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.48503665	0.06320405	0.01824688	1.35606061	1.56852745	UNEQUAL	-0.6242	25.9	0.5380
2	27	1.85977374	0.07186013	0.01498419	1.36015326	1.65560166	EQUAL	-0.5755	37.0	0.5694

FOR H0: VARIANCES ARE EQUAL, P' = 1.52 WITH 26 AND 11 DF PROB > P' = 0.4750

VARIABLE: R5 THIGH GIRTH/CALP GIRTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.63365804	0.08059788	0.02326660	1.52564103	1.79245283	UNEQUAL	0.5587	32.0	0.5802
2	28	1.61449197	0.12685915	0.02337413	1.08152174	1.71875000	EQUAL	0.4688	38.0	0.6419

FOR H0: VARIANCES ARE EQUAL, P' = 2.48 WITH 27 AND 11 DF PROB > P' = 0.1158

VARIABLE: R6 BICEPS GIRTH/FOREARM GIRTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.13070373	0.055330617	0.01596552	1.04580153	1.20300752	UNEQUAL	0.0553	19.8	0.9565
2	28	1.12966679	0.05208043	0.00984228	1.00769231	1.23282443	EQUAL	0.0567	38.0	0.9551

FOR H0: VARIANCES ARE EQUAL, P' = 1.13 WITH 11 AND 27 DF PROB > P' = 0.7583

VARIABLE: R7 HEIGHT/ARM LENGTH

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	2.28733976	0.02854674	0.00850717	2.25316456	2.33333333	UNEQUAL	-1.8930	30.7	0.0678
2	22	2.31419671	0.05289995	0.01127831	2.22641509	2.44137931	EQUAL	-1.5654	31.0	0.1276

FOR H0: VARIANCES ARE EQUAL, P' = 3.43 WITH 21 AND 10 DF PROB > P' = 0.0085

VARIABLE: R8 ARM SPAN/HEIGHT

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	11	1.01744483	0.02044092	0.00616317	0.98918414	1.04624277	UNEQUAL	1.8316	23.6	0.0797
2	22	1.00312907	0.02435055	0.00519155	0.97041420	1.05481805	EQUAL	1.7257	31.0	0.0944

FOR H0: VARIANCES ARE EQUAL, P' = 1.42 WITH 21 AND 10 DF PROB > P' = 0.5793

T TEST BETWEEN VARIABLES FOR VBALL TESTS

TTEST PROCEDURE

VARIABLE: R9		HEIGHT/LEG LENGTH									
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	11	2.15800191	0.16569841	0.04995995	1.49743590	2.52482270	UNEQUAL	1.0395	11.7	0.3197	
2	22	2.10399071	0.06696854	0.01427690	1.96341463	2.21383644	EQUAL	1.3411	31.0	0.1896	

FOR H0: VARIANCES ARE EQUAL, F' = 6.12 WITH 10 AND 21 DF PROB > F' = 0.0005

VARIABLE: R10											
HEIGHT/TRUNK											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	11	1.47133905	0.06444450	0.01959507	1.17889447	1.98711063	UNEQUAL	-1.7970	24.2	0.0848	
2	22	1.41801017	0.07445011	0.01704542	1.42454545	2.17177914	EQUAL	-1.6751	31.0	0.1040	

FOR H0: VARIANCES ARE EQUAL, F' = 1.51 WITH 21 AND 10 DF PROB > F' = 0.5061

VARIABLE: R11											
UPPER LEG LENGTH/LOWER LEG LENGTH											
IX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	11	0.69242785	0.11624344	0.05313940	0.41000000	1.11956522	UNEQUAL	-1.0834	12.4	0.2993	
2	22	0.75372043	0.08453626	0.01802319	0.61224440	0.98780484	EQUAL	-1.3504	31.0	0.1867	

FOR H0: VARIANCES ARE EQUAL, F' = 4.35 WITH 10 AND 21 DF PROB > F' = 0.0044

VARIABLE: R12		TOT									
IX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	11	0.47317369	0.08470109	0.02704590	0.12107692	1.00000000	UNEQUAL	-1.3308	15.1	0.2031	
2	22	0.4132523	0.06271587	0.01337107	0.42812500	1.04907975	EQUAL	-1.4992	31.0	0.1439	

FOR H0: VARIANCES ARE EQUAL, F' = 2.05 WITH 10 AND 21 DF PROB > F' = 0.1606

VARIABLE: R13											
XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T	
1	11	2.50247803	0.16154040	0.04872146	2.18434411	2.79106854	UNEQUAL	-3.6291	25.7	0.0013	
2	22	2.74400670	0.21265077	0.04533730	2.48861412	3.15244507	EQUAL	-3.3096	31.0	0.0024	

FOR H0: VARIANCES ARE EQUAL, F' = 1.13 WITH 21 AND 10 DF PROB > F' = 0.3719

T TEST BETWEEN VARIABLES FOR VALL TESTS
TTEST PROCEDURE

VARIABLE: R14

XX	N	MEAN	STD DEV	STD ERROR	MINIMUM	MAXIMUM	VARIANCES	T	DF	PROB > T
1	12	1.13070373	0.05530617	0.01596552	1.04540153	1.20300752	UNPOWAL	0.0553	19.8	0.9565
2	28	1.12466679	0.05208043	0.00984224	1.00769231	1.23282443	EQUAL	0.3567	38.0	0.9551

FOR H0: VARIANCES ARE EQUAL, P= 1.13 WITH 11 AND 27 DF PROB > F= 0.7583

APPENDIX D
CORRELATION MATRIX

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

SM
SUBJECT NUMBERAS
AGEWT
WEIGHT (IN KILOGRAMS)HT
HEIGHT (IN CENTIMETRES)ASP
ARM SPAN

SM	AG	WT	HT	ASP	PL	TL	LL	LLL	OLL
1.00000	0.06246	-0.05190	-0.39211	-0.17821	0.04086	-0.11971	-0.41091	-0.17650	-0.29368
0.00000	0.6981	0.7472	0.0240	0.2712	0.8049	0.5001	0.0175	0.2759	0.0972
41	41	41	33	40	39	34	33	40	33
0.06246	1.00000	-0.21694	0.00468	-0.19292	-0.05210	-0.16658	0.23602	-0.29458	0.41196
0.6981	0.00000	0.1731	0.9794	0.2330	0.7524	0.3464	0.1861	0.0650	0.0172
41	41	41	33	40	39	34	33	40	33
-0.05190	-0.21694	1.00000	0.59536	0.70825	0.18362	0.40703	0.47411	0.52888	0.21716
0.7472	0.1731	0.0000	0.0003	0.0001	0.2632	0.0169	0.0053	0.0005	0.2248
41	41	41	33	40	39	34	33	40	33
-0.39211	0.00468	0.59536	1.00000	0.78905	-0.15445	0.59624	0.68044	0.60187	0.41685
0.0240	0.9794	0.0003	0.0000	0.0001	0.3852	0.0003	0.0001	0.0002	0.0158
33	33	33	34	33	32	33	33	33	33
-0.17821	-0.19292	0.70825	0.78905	1.00000	0.00501	0.41175	0.55981	0.64856	0.21022
0.2712	0.2330	0.0001	0.0001	0.0000	0.4754	0.0155	0.0007	0.0001	0.2403
40	40	40	33	40	39	34	33	40	33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	SN	AG	WT	HT	ASP	PL	FL	LI	LLL	ULL
PL FLEXIBILITY	0.04046 39	-0.05210 39	0.14362 34	-0.15885 32	0.00501 39	1.00000 39	0.12650 33	-0.15066 32	-0.15393 39	-0.07777 32
TL TRUNK LENGTH	-0.11971 34	-0.16658 34	0.40703 34	0.59624 33	0.41175 34	0.10650 33	1.00000 34	0.01905 33	0.22412 34	-0.09580 33
LL TOTAL LEG LENGTH	-0.41091 33	0.23602 33	0.47411 33	0.68044 33	0.55481 33	-0.15066 32	0.01905 33	1.00000 33	0.35460 33	0.98011 33
LLL LOWER LEG LENGTH	-0.17650 40	-0.29458 40	0.52888 40	0.60187 33	0.64856 40	-0.15393 39	0.22412 34	0.35460 33	1.00000 40	-0.13072 33
ULL UPPER LEG LENGTH	-0.29368 33	0.41196 33	0.21716 33	0.41645 33	0.21022 33	-0.07777 32	-0.09580 33	0.88011 33	-0.13072 33	1.00000 33
AL TOTAL ARM LENGTH	-0.18283 40	-0.08547 40	0.74499 40	0.87289 33	0.84891 40	-0.01669 39	0.43480 34	0.69397 33	0.69193 40	0.37016 33
UAL UPPER ARM LENGTH	-0.10452 40	-0.06391 40	0.71850 40	0.67906 33	0.61444 40	0.05085 34	0.33420 34	0.63002 33	0.50674 40	0.37664 33
LAL LOWER ARM LENGTH	-0.21968 40	-0.08803 40	0.59483 40	0.86542 33	0.85705 40	-0.07698 34	0.47864 34	0.59543 33	0.70887 40	0.26837 33
HL HAND LENGTH	0.05044 40	0.00298 40	0.55409 40	0.69902 33	0.71862 40	-0.00429 34	0.46968 34	0.46126 33	0.39963 40	0.19531 33
APCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.12657 40	-0.05067 40	0.00821 40	0.17664 33	0.13313 40	-0.24773 34	0.31856 34	0.27702 33	0.09609 40	0.21182 33
STPE STAND AND REACH HEIGHT	-0.36135 33	-0.07061 33	0.70244 33	0.43344 32	0.40514 33	-0.15674 32	0.53139 33	0.69297 32	0.67132 33	0.39565 32
CPG CALP GIRTH	0.04084 40	-0.32146 40	0.64946 40	0.12422 33	0.11483 40	0.24456 34	0.10778 34	0.06048 33	0.35903 40	-0.06833 33
THG THIGH GIRTH	-0.11450 40	-0.11217 40	0.62000 40	0.01837 33	0.21726 40	0.36123 34	0.10349 14	0.07867 33	0.21923 40	0.00743 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	SN	AG	WT	HT	ASP	FL	TL	LL	LLL	ULL
ARG ABDOMINAL GIRTH	-0.12549 0.4404 40	-0.04223 0.7959 40	0.73930 0.0001 40	0.37099 0.0335 33	0.46501 0.0025 40	0.21462 0.1845 39	0.15364 0.3857 34	0.43473 0.0115 33	0.35789 0.0234 40	0.25829 0.1467 33
HIPG HIP GIRTH	0.07059 0.6651 40	-0.10508 0.5187 40	0.87675 0.0001 40	0.42939 0.0126 33	0.51020 0.0008 40	0.18743 0.2532 39	0.19164 0.2776 34	0.51650 0.0021 33	0.45889 0.0029 40	0.30968 0.0805 33
CHG CHEST GIRTH	0.10369 0.5243 40	-0.08654 0.5954 40	0.81313 0.0001 40	0.21407 0.2316 33	0.43265 0.0053 40	0.36879 0.0204 39	0.30618 0.0782 34	0.20535 0.2516 33	0.23874 0.1379 40	0.11257 0.5328 33
BIG BICEPS GIRTH	0.24308 0.1307 40	-0.06135 0.7069 40	0.78909 0.0001 40	0.13973 0.4380 33	0.33470 0.0344 40	0.28639 0.0771 39	0.21421 0.2238 34	0.26191 0.1409 33	0.06651 0.6834 40	0.29992 0.0999 33
PRG FOREARM GIRTH	0.15741 0.3320 40	-0.29456 0.0650 40	0.66445 0.0001 40	0.17394 0.3330 33	0.43656 0.0049 40	0.20944 0.2007 39	0.13133 0.3047 34	0.12438 0.4904 33	0.24524 0.1272 40	0.03079 0.8649 33
ANKG ANKLE GIRTH	0.03988 0.8095 39	-0.26340 0.1052 39	0.59971 0.0001 34	0.35985 0.0431 32	0.49382 0.0014 39	0.18410 0.2619 39	0.41582 0.0161 33	-0.00107 0.9953 32	0.59483 0.0001 39	-0.28736 0.1108 32
SHD SHOULDER DIAMETER	-0.04333 0.7906 40	-0.36907 0.0191 40	0.48794 0.0014 40	0.20507 0.2523 33	0.50435 0.0009 40	0.26543 0.1024 34	0.06592 0.7111 34	0.08271 0.6472 33	0.34389 0.0298 40	-0.07728 0.6690 33
CHD CHEST DIAMETER	0.09315 0.5675 40	-0.02948 0.8567 40	0.70513 0.0001 40	0.16622 0.3552 33	0.41245 0.0082 40	0.30296 0.0608 39	0.09609 0.5888 34	0.23465 0.1887 33	0.21994 0.1727 40	0.13956 0.4396 33
BILD BI-ILIAC DIAMETER	-0.27146 0.0402 40	-0.05061 0.7565 40	0.31534 0.0474 40	0.41913 0.0152 33	0.33484 0.0347 40	0.00423 0.4746 34	0.10729 0.5459 34	0.33359 0.0578 31	0.44608 0.0039 40	0.10426 0.5637 33
KND KNEE DIAMETER	-0.11445 0.4819 40	-0.25112 0.1180 40	0.74026 0.0001 40	0.35918 0.0401 33	0.51982 0.0006 40	0.12280 0.4564 39	0.25815 0.1252 34	0.27401 0.1228 33	0.38156 0.0151 40	0.09475 0.5999 33
ANKD ANKLE DIAMETER	0.13291 0.4136 40	-0.14511 0.3716 40	0.63932 0.0001 40	0.41506 0.0163 33	0.53308 0.0004 40	0.19264 0.2400 39	0.51996 0.0016 34	0.10471 0.5520 33	0.42593 0.0061 40	-0.08887 0.6228 33
WRD WRIST DIAMETER	0.04063 0.8034 40	-0.06457 0.6922 40	0.64456 0.0001 40	0.55444 0.0008 33	0.63053 0.0001 40	0.03960 0.4104 39	0.43615 0.0099 34	0.28925 0.1025 31	0.34560 0.0249 40	0.12521 0.4975 33
RISK BICEPS SKINFOLD	0.04303 0.5680 40	-0.01120 0.9453 40	0.41797 0.0074 40	-0.24674 0.1663 33	0.04180 0.7479 40	0.43332 0.0054 39	-0.04995 0.7791 34	0.06033 0.7147 31	-0.03490 0.8307 40	0.16289 0.3651 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PFCB > 171 UNDER HC:RHO=0 / NUMBER OF OBSERVATIONS

	SN	AG	WT	HT	ASP	PL	IL	LL	LLL	ULL
TRISK										
TRICEPS SKINFOLD	0.22457 0.1541 40	0.04378 0.7885 40	0.39953 0.0106 40	-0.06512 0.7188 33	0.00218 0.9846 40	0.27095 0.0952 39	-0.04870 0.7845 34	0.19730 0.2711 33	-0.14764 0.3633 40	0.32882 0.0517 33
SUBS										
SUBSCAPULAR SKINFOLD	0.04081 0.4026 40	-0.13772 0.3967 40	0.24798 0.1229 40	-0.00777 0.9658 33	-0.10806 0.5069 40	0.04582 0.7818 39	-0.18280 0.3008 34	0.26344 0.1385 33	-0.00002 0.9999 40	0.21914 0.2205 33
SUPI										
SUPRA-ILIAC SKINFOLD	0.09071 0.5778 40	-0.09752 0.5494 40	0.17674 0.2753 40	-0.38498 0.0493 33	-0.21803 0.1765 40	0.38824 0.0146 39	-0.19140 0.2782 34	0.00949 0.9582 33	-0.23475 0.1448 40	0.10049 0.5779 33
TOSK										
TOTAL SKINFOLD	0.15844 0.3273 40	-0.06137 0.7068 40	0.40970 0.0047 40	-0.20906 0.2430 33	-0.09589 0.5562 40	0.37305 0.0193 39	-0.15593 0.3785 34	0.17239 0.3374 33	-0.14890 0.3592 40	0.26586 0.1348 33
RODP										
PERCENTAGE BODY FAT	0.11762 0.4698 40	-0.08104 0.6191 40	0.42006 0.0070 40	-0.17646 0.3259 33	-0.04719 0.7725 40	0.33759 0.0356 39	-0.14800 0.4035 34	0.24069 0.1773 33	-0.11079 0.4961 40	0.30775 0.0815 33
SPJ										
SPIKE JUMP	-0.17897 0.3112 34	-0.07512 0.6729 34	0.64510 0.0001 34	0.70485 0.0001 33	0.80995 0.0001 34	0.02691 0.8818 33	0.50647 0.0022 34	0.34077 0.0523 33	0.60937 0.0001 34	0.04909 0.7861 33
SH										
SHUTTLE RUN	-0.06829 0.6714 41	-0.03198 0.8426 41	-0.31725 0.0433 41	-0.01857 0.9183 33	-0.24229 0.1320 40	-0.22912 0.1606 39	-0.13635 0.4420 34	0.04899 0.7865 33	-0.18171 0.2618 40	0.15840 0.3786 33
PO										
PUSH-UPS	-0.07641 0.6439 39	-0.16121 0.3269 39	-0.01006 0.9515 39	-0.04985 0.7864 32	0.04599 0.7810 39	0.43194 0.0064 34	-0.17420 0.3323 33	-0.05093 0.7819 32	0.01073 0.9483 39	-0.09348 0.6108 32
RL										
BLOCK JUMP	-0.19232 0.2759 34	-0.10650 0.5488 34	0.64017 0.0001 34	0.77064 0.0001 33	0.41419 0.0001 34	-0.02399 0.8946 33	0.55165 0.0007 34	0.40227 0.0203 33	0.63281 0.0001 34	0.10289 0.5688 33
RJ										
BEST OF THREE SUCCESSIVE BROAD JUMPS	-0.12767 0.4386 39	0.13468 0.4137 39	0.34236 0.0135 39	0.31744 0.0767 32	0.43725 0.0054 39	-0.06102 0.7159 38	0.20736 0.2469 33	0.22386 0.2141 32	0.28783 0.0756 39	0.06200 0.7360 32
GP										
GRIP STRENGTH	-0.00924 0.9543 41	0.03736 0.8166 41	0.67432 0.0001 41	0.64939 0.0001 33	0.65254 0.0001 40	0.09654 0.5547 34	0.43251 0.0106 34	0.47640 0.0051 33	0.44431 0.0041 40	0.30085 0.0889 33
VO										
VOLLEY TPST SCORE	0.03057 0.8637 34	0.08217 0.6441 34	0.42555 0.0121 40	0.14554 0.2833 32	0.36262 0.0381 33	0.22647 0.2040 33	-0.03419 0.3502 33	0.27962 0.1212 32	0.17594 0.3274 33	0.21194 0.2442 32
SE										
SERVE TEST SCORE	0.34342 0.0312 30	0.04954 0.6378 30	-0.14364 0.3312 30	-0.11449 0.5445 24	-0.02445 0.4978 24	0.10432 0.5902 24	-0.25395 0.1665 29	-0.06247 0.7522 24	0.07583 0.6458 29	-0.09872 0.6172 28

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	SN	AG	WT	HT	ASP	PL	TL	LL	LLL	ULL
POS POSITION USUALLY PLAYED										
	-0.00583 0.9715 40	0.07541 0.6437 40	-0.24924 0.1204 40	-0.48802 0.0040 33	-0.54370 0.0003 40	0.14402 0.1645 39	-0.24394 0.1644 34	-0.31525 0.0734 33	-0.49185 0.0013 40	-0.08544 0.6364 33
ST STARTER OR NOT?										
	-0.03340 0.8379 40	0.06287 0.6399 40	0.18701 0.2474 40	0.04330 0.8104 33	0.12382 0.4465 40	0.29053 0.0728 39	0.05015 0.7354 34	-0.04960 0.7840 33	0.04655 0.7755 40	-0.06758 0.7086 33
LEV LEVEL OF PLAY										
	-0.02662 0.8705 40	0.15474 0.3404 40	0.16471 0.3048 40	0.24027 0.1780 33	0.24310 0.1307 40	-0.06885 0.6771 39	0.18176 0.3036 34	0.16763 0.3511 33	0.00798 0.9610 40	0.11266 0.5325 33
EXP YEARS OF EXPERIENCE										
	0.13613 0.8023 40	0.66158 0.0001 40	-0.29829 0.0615 40	-0.21112 0.2382 33	-0.34190 0.0308 40	0.00742 0.4642 39	-0.43321 0.0105 34	0.07349 0.6844 33	-0.14630 0.3677 40	0.15214 0.3980 33
VRAB SELF-EVALUATION OF VOLLEYBALL ABILITY										
	0.07303 0.6543 40	0.38172 0.0151 40	0.18046 0.2651 40	0.08593 0.6344 33	0.12908 0.4273 40	0.28022 0.0840 39	0.05219 0.7268 34	0.05842 0.7467 33	-0.01546 0.9245 40	0.05886 0.7449 33
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL										
	0.22038 0.1718 40	0.34828 0.0276 40	0.15127 0.3515 40	0.00849 0.4626 33	0.11718 0.4715 40	0.34156 0.0333 39	0.23786 0.1755 34	-0.09661 0.5928 33	-0.15308 0.3457 40	-0.03094 0.8643 33
VJMP VERTICAL JUMP										
	0.15882 0.3773 33	-0.04002 0.8250 33	0.22712 0.2037 33	0.07744 0.6716 32	0.24768 0.1646 33	0.27574 0.1265 32	0.23360 0.1907 33	0.23128 0.2028 32	0.22269 0.2129 33	-0.36484 0.04010 32
PTWD FOOT WIDTH										
	0.02812 0.8633 40	-0.19117 0.2373 40	0.11988 0.0442 40	-0.04258 0.8140 33	0.12616 0.4379 40	0.20790 0.2041 39	0.06316 0.7227 34	-0.17033 0.3433 33	0.29961 0.0504 40	-0.26610 0.1344 33
XX HIGHLY SKILLED PLAYER?										
	0.10457 0.5153 41	0.20822 0.1914 41	-0.44465 0.0033 41	-0.30761 0.0816 33	-0.50534 0.0009 40	-0.19382 0.2371 39	-0.45518 0.0068 34	-0.01215 0.9465 33	-0.23426 0.1457 40	0.15583 0.3865 33
R1 UPPER ARM LENGTH/LOWER ARM LENGTH										
	0.03385 0.8157 40	-0.01871 0.9088 40	0.40898 0.0088 40	0.15752 0.3813 33	0.10652 0.5130 40	0.11363 0.4410 34	0.09056 0.6105 34	0.30815 0.0810 33	0.09679 0.5524 40	0.24776 0.1645 33
R2 SHOULDER DIAMETER/CHEST DIAMETER										
	-0.15382 0.3433 40	-0.31628 0.0468 40	-0.31022 0.0514 40	0.01633 0.9281 33	0.01002 0.9511 40	-0.09314 0.5728 39	-0.04011 0.3218 34	-0.15348 0.3938 33	0.07181 0.6597 40	-0.19297 0.2820 33
R3 SHOULDER DIAMETER/BI ILIAC DIAMETER										
	0.22463 0.1635 40	-0.28373 0.0760 40	0.14206 0.4819 40	-0.20133 0.2612 33	0.12754 0.4324 40	0.23338 0.1524 39	-0.04819 0.7867 34	-0.21885 0.2211 33	-0.11671 0.4733 40	-0.15266 0.3964 33
R4 CALP BIRTH/ANKLE CIRCUM										
	0.10415 0.5122 39	-0.14406 0.3416 39	0.24045 0.1093 39	-0.21840 0.2244 32	-0.04137 0.5401 30	0.16436 0.1054 34	-0.23351 0.1094 33	0.04004 0.8278 32	-0.13488 0.4130 39	0.15085 0.4099 32

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |PI| UNDER H0:PHO=0 / NUMBER OF OBSERVATIONS

	SN	AG	WT	HT	ASP	PL	TL	LL	LLL	ULL
R5 THIGH GIRTH/CALF GIRTH	-0.20228 0.2107 40	0.14264 0.3799 40	0.12221 0.4525 40	-0.08339 0.6445 33	-0.02053 0.9000 40	0.17736 0.2801 39	0.02587 0.3845 34	0.02667 0.8829 33	-0.03197 0.8448 40	0.05615 0.7563 33
R6 BICEPS GIRTH/FOREARM GIRTH	0.19005 0.2402 40	0.20258 0.2100 40	0.43854 0.0046 40	0.00674 0.9703 33	0.03680 0.8216 40	0.18521 0.2590 34	0.09215 0.6042 34	0.20328 0.2565 33	-0.15396 0.3429 40	0.33658 0.0555 33
R7 HEIGHT/ARM LENGTH	-0.12479 0.4490 33	0.21847 0.2219 33	-0.52844 0.0016 33	-0.06208 0.7315 33	-0.43846 0.0107 33	-0.09249 0.6146 32	0.02934 0.8712 33	-0.24660 0.1665 33	-0.44641 0.0092 33	-0.03237 0.8581 33
R8 ARM SPAN/HEIGHT	0.07834 0.6648 33	-0.44464 0.0095 33	0.17043 0.3430 33	-0.25335 0.1549 33	0.39407 0.0233 33	0.12018 0.5124 32	-0.21934 0.2200 33	-0.13095 0.4676 33	0.28124 0.1129 33	-0.24399 0.1092 33
R9 HEIGHT/LEG LENGTH	0.25034 0.1600 33	-0.31571 0.0735 33	-0.17060 0.3425 33	-0.16914 0.3467 33	-0.14632 0.3549 33	0.10890 0.5530 32	0.41850 0.0154 33	-0.83395 0.0001 33	-0.03663 0.8396 33	-0.86484 0.0001 33
R10 HEIGHT/TRUNK	-0.20352 0.2560 33	0.18358 0.3065 33	-0.31141 0.4448 33	0.15243 0.3971 33	0.17242 0.3373 33	-0.25269 0.1629 32	-0.70051 0.0001 33	0.56083 0.0007 33	0.26048 0.1432 33	0.46392 0.0065 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	-0.16510 0.3585 33	0.47727 0.0050 33	0.20611 0.4731 33	0.18544 0.3015 33	-0.05978 0.7411 31	0.00927 0.9594 32	-0.13796 0.4439 33	0.66159 0.0001 33	-0.44402 0.0065 33	0.93715 0.0001 33
R12 TOT	-0.26423 0.1373 33	0.27198 0.1257 33	0.12480 0.4849 33	0.20057 0.2631 33	0.20491 0.2526 33	-0.17429 0.3262 32	-0.59219 0.0003 33	0.79176 0.0001 33	0.16960 0.3454 33	0.75362 0.0001 33
R13	0.02809 0.8767 33	0.38871 0.0254 33	-0.91840 0.0001 33	-0.24814 0.1638 33	-0.44697 0.0062 33	-0.20433 0.2420 32	-0.24336 0.1723 33	-0.23431 0.1894 31	-0.40888 0.0141 33	-0.32968 0.8698 33
R14	0.19005 0.2402 40	0.20258 0.2100 40	0.43854 0.0046 40	0.00674 0.9703 33	0.03680 0.8216 40	0.18521 0.2540 39	0.09215 0.6042 34	0.20328 0.2565 33	-0.15396 0.3429 40	0.33658 0.0555 33
S4 SUBJECT NUMBER	-0.14283 0.2584 40	-0.10852 0.5051 40	-0.21964 0.1732 40	0.05044 0.7572 40	-0.12657 0.4364 40	-0.36135 0.0384 33	0.04083 0.5773 40	-0.11950 0.4627 40	-0.12549 0.4404 40	0.07059 0.6651 40
AG AGE	-0.04547 0.6000 40	-0.06391 0.6452 40	-0.04403 0.5441 40	0.00294 0.4854 40	-0.05067 0.7562 40	-0.07061 0.6462 31	-0.32146 0.0431 40	-0.11217 0.4908 40	-0.04223 0.7459 40	-0.10508 0.5187 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > IPI UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	AL	UAL	LAL	HL	ARCH	STRE	CPG	TRG	ABG	RIPG
WT WEIGHT (IN KILOGRAMS)	0.74499 0.0001 40	0.71850 0.0001 40	0.59483 0.0001 40	0.55509 0.0002 40	0.00821 0.9549 40	0.70248 0.0001 33	0.69956 0.0001 40	0.62020 0.0001 40	0.73930 0.0001 40	0.87675 0.0001 40
HT HEIGHT (IN CENTIMETRES)	0.87289 0.0001 33	0.67906 0.0001 33	0.46542 0.0001 33	0.69902 0.0001 33	0.37664 0.0307 33	0.93398 0.0001 32	0.12922 0.4736 33	0.01837 0.9192 33	0.37099 0.0335 33	0.42939 0.0126 33
ASP ARM SPAN	0.84841 0.0001 40	0.61949 0.0001 40	0.86705 0.0001 40	0.73862 0.0001 40	0.13313 0.4128 40	0.90514 0.0001 33	0.31483 0.0479 40	0.21725 0.1781 40	0.46501 0.0025 40	0.51020 0.0008 40
PL PLEXIBILITY	-0.01669 0.9197 39	0.05085 0.7585 39	-0.07688 0.6418 39	-0.00429 0.9793 39	-0.24773 0.1288 39	-0.15679 0.3915 32	0.29456 0.0791 39	0.36123 0.0239 39	0.21462 0.1895 39	0.18743 0.2532 39
TL TRUNK LENGTH	0.48480 0.0037 34	0.38420 0.0249 34	0.47868 0.0042 34	0.46968 0.0051 34	0.31856 0.0663 34	0.53139 0.0015 33	0.10778 0.5840 34	0.10399 0.5588 34	0.15364 0.3857 34	0.19164 0.2776 34
LL TOTAL LEG LENGTH	0.69397 0.0001 33	0.63002 0.0001 33	0.59543 0.0003 33	0.46126 0.0069 33	0.27702 0.1186 33	0.69297 0.0001 32	0.05098 0.7360 33	0.07467 0.6634 33	0.43473 0.0115 33	0.51650 0.0021 33
LLL LOWER LEG LENGTH	0.69193 0.0001 40	0.50674 0.0009 40	0.70887 0.0001 40	0.39963 0.0106 40	0.09609 0.5553 40	0.67132 0.0001 33	0.35903 0.0229 40	0.23823 0.1388 40	0.35789 0.0234 40	0.45889 0.0029 40
ULL UPPER LEG LENGTH	0.37016 0.0340 33	0.37664 0.0307 33	0.26437 0.1310 33	0.19531 0.2760 33	0.21782 0.2233 33	0.39565 0.0250 32	-0.06833 0.7055 33	0.00743 0.9672 33	0.25829 0.1467 33	0.30868 0.0805 33
AL TOTAL ARM LENGTH	1.00000 0.0000 40	0.88083 0.0001 40	0.45442 0.0001 40	0.58765 0.0001 40	0.24685 0.1246 40	0.90060 0.0001 33	0.35637 0.0240 40	0.20499 0.2045 40	0.49240 0.0013 40	0.59767 0.0001 40
UAL UPPER ARM LENGTH	0.44083 0.0001 40	1.00000 0.0000 40	0.51544 0.0007 40	0.34454 0.0275 40	0.17527 0.2794 40	0.71549 0.0001 33	0.35583 0.0242 40	0.27020 0.0918 40	0.50924 0.0008 40	0.58230 0.0001 40
LAL LOWER ARM LENGTH	0.85642 0.0001 40	0.51544 0.0007 40	1.00000 0.0000 40	0.64877 0.0001 40	0.22893 0.1553 40	0.84915 0.0001 33	0.27127 0.0833 40	0.10178 0.5320 40	0.36990 0.0188 40	0.47802 0.0018 40
HL HAND LENGTH	0.54765 0.0001 40	0.34454 0.0275 40	0.64877 0.0001 40	1.00000 0.0000 40	0.24542 0.0643 40	0.74968 0.0001 33	0.31310 0.0492 40	0.16393 0.3121 40	0.30539 0.0553 40	0.43710 0.0048 40
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	0.24685 0.1246 40	0.17527 0.2794 40	0.22893 0.1553 40	0.24542 0.0643 40	1.00000 0.0000 40	0.23001 0.1479 34	0.03300 0.3398 40	-0.15419 0.3421 40	-0.19483 0.2147 40	0.06001 0.7130 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |P| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	AL	UAL	LAL	HL	ARCH	STPR	CPG	TRG	ABG	HIPG
STRZ STAND AND REACH HEIGHT	0.90060 0.0001 33	0.71548 0.0001 33	0.88915 0.0001 33	0.78968 0.0001 33	0.23001 0.1979 33	1.00000 0.0000 33	0.19530 0.2761 33	0.11750 0.5149 33	0.48942 0.0038 33	0.51190 0.0020 33
CPG CALP GIRTH	0.35637 0.0240 40	0.35583 0.0242 40	0.27727 0.0833 40	0.31310 0.0442 40	0.03100 0.8398 40	0.19530 0.2761 33	1.00000 0.0000 40	0.51086 0.0008 40	0.38728 0.0136 40	0.59872 0.0001 40
TRG THIGH GIRTH	0.20499 0.2045 40	0.27020 0.0918 40	0.10174 0.5320 40	0.16393 0.3121 40	-0.15419 0.3421 40	0.11750 0.5149 33	0.51086 0.0008 40	1.00000 0.0000 40	0.55669 0.0002 40	0.64228 0.0001 40
ABG ABDOMINAL GIRTH	0.49240 0.0013 40	0.50924 0.0008 40	0.34940 0.0184 40	0.30539 0.0553 40	-0.19883 0.2187 40	0.48942 0.0038 33	0.33728 0.0136 40	0.55669 0.0002 40	1.00000 0.0000 40	0.71720 0.0001 40
HIPG HIP GIRTH	0.59767 0.0001 40	0.58230 0.0001 40	0.47802 0.0018 40	0.43710 0.0048 40	0.06001 0.7130 40	0.51790 0.0020 33	0.53472 0.0001 40	0.64228 0.0001 40	0.71720 0.0001 40	1.00000 0.0000 40
CHG CHEST GIRTH	0.47859 0.0018 40	0.55832 0.0002 40	0.29714 0.0626 40	0.29788 0.0619 40	-0.17832 0.2709 40	0.36519 0.0366 33	0.60418 0.0001 40	0.56575 0.0001 40	0.69256 0.0001 40	0.71585 0.0001 40
BIG BICEPS GIRTH	0.38943 0.0130 40	0.47656 0.0019 40	0.22607 0.1607 40	0.36234 0.0216 40	-0.06749 0.6790 40	0.25198 0.1572 33	0.66297 0.0001 40	0.55309 0.0002 40	0.58955 0.0001 40	0.76368 0.0001 40
PRG FOREARM GIRTH	0.39712 0.0112 40	0.37846 0.0160 40	0.32891 0.0382 40	0.40657 0.0092 40	-0.00220 0.4893 40	0.30475 0.0804 33	0.72767 0.0001 40	0.31554 0.0473 40	0.36276 0.0214 40	0.58031 0.0001 40
ANKG ANKLE GIRTH	0.51726 0.0007 39	0.47665 0.0022 39	0.43244 0.0054 39	0.43816 0.0053 39	-0.08279 0.6163 39	0.44471 0.0108 32	0.55420 0.0003 39	0.36732 0.0214 39	0.33420 0.0376 39	0.40585 0.0104 39
SHD SHOULDER DIAMETER	0.33343 0.0355 40	0.27013 0.0918 40	0.32373 0.0416 40	0.20483 0.2044 40	-0.26095 0.1039 40	0.35844 0.0405 33	0.35663 0.3239 40	0.10836 0.5057 40	0.40796 0.0090 40	0.34577 0.0289 40
CHD CHEST DIAMETER	0.40500 0.0095 40	0.52000 0.0006 40	0.14804 0.2205 40	0.31151 0.0504 40	-0.25652 0.1101 40	0.33446 0.0533 33	0.49190 0.0016 40	0.42345 0.0065 40	0.66447 0.0001 40	0.58584 0.0001 40
BILO BI-ILIAC DIAMETER	0.33497 0.0346 40	0.22297 0.1667 40	0.38443 0.0143 40	0.15015 0.3551 40	-0.03744 0.8184 40	0.44440 0.0034 33	0.03448 0.0030 40	0.03914 0.8103 40	0.48815 0.0014 40	0.34472 0.0274 40
KND KNEE DIAMETER	0.52405 0.0005 40	0.57486 0.0001 40	0.35162 0.0261 40	0.37827 0.0161 40	0.04174 0.7445 40	0.51414 0.0022 33	0.52510 0.0005 40	0.44894 0.0014 40	0.62447 0.0001 40	0.68802 0.0001 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |P| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	AL	UAL	LAL	HL	APCH	STRP	CPG	THG	ABG	HIPG
ANKD ANKLE DIAMETER	0.54375	0.46246	0.44115	0.53497	0.01654	0.49015	0.44229	0.36360	0.43466	0.50703
	0.0003	0.0027	0.0017	0.0004	0.9193	0.0034	0.0043	0.0211	0.0051	0.0008
	40	40	40	40	40	33	40	40	40	40
WRD WRIST DIAMETER	0.67446	0.66787	0.50419	0.46636	0.16300	0.67289	0.33159	0.16101	0.35755	0.42500
	0.0001	0.0001	0.0004	0.0024	0.3144	0.0001	0.0151	0.3209	0.0235	0.0063
	40	40	40	40	40	33	40	40	40	40
RISK BICEPS SKINFOLD	0.04507	0.20577	-0.12218	-0.07486	-0.26229	-0.08454	0.40422	0.51537	0.45872	0.44964
	0.1425	0.2021	0.4526	0.6462	0.1020	0.6397	0.0097	0.0007	0.0029	0.0036
	40	40	40	40	40	33	40	40	40	40
TRISK TRICEPS SKINFOLD	0.03468	0.08892	-0.01058	0.05220	0.01418	-0.12979	0.47875	0.41322	0.32888	0.54771
	0.4318	0.5853	0.9484	0.7440	0.9304	0.4716	0.0018	0.0080	0.0383	0.0003
	40	40	40	40	40	33	40	40	40	40
SUBS SUBSCAPULAR SKINFOLD	0.06232	0.25094	-0.14250	-0.18817	0.13224	0.00429	0.11706	0.18940	0.38260	0.44508
	0.7025	0.1183	0.3804	0.2449	0.4160	0.9411	0.4643	0.2418	0.0148	0.0040
	40	40	40	40	40	33	40	40	40	40
SUP1 SUPRA-ILIAC SKINFOLD	-0.15838	0.07611	-0.35702	-0.15475	-0.16020	-0.28486	0.25755	0.32877	0.38247	0.28688
	0.3290	0.6407	0.0237	0.3404	0.3234	0.1041	0.1086	0.0383	0.0149	0.0727
	40	40	40	40	40	33	40	40	40	40
TOSK TOTAL SKINFOLD	-0.00416	0.19581	-0.20514	-0.11116	-0.08179	-0.17100	0.42547	0.47639	0.50536	0.57447
	0.9553	0.2259	0.2041	0.4947	0.6158	0.4414	0.0062	0.0019	0.0009	0.0001
	40	40	40	40	40	33	40	40	40	40
BODY PERCENTAGE BODY FAT	0.04460	0.24227	-0.15615	-0.10388	-0.10232	-0.11361	0.36886	0.47200	0.52523	0.59275
	0.7847	0.1320	0.3359	0.5215	0.5298	0.5290	0.0192	0.0021	0.0005	0.0001
	40	40	40	40	40	33	40	40	40	40
SPJ SPIKE JUMP	0.72500	0.59457	0.72735	0.64811	-0.03581	0.78578	0.19193	0.16978	0.42933	0.82846
	0.0001	0.0002	0.0001	0.0001	0.4406	0.0001	0.2768	0.3371	0.0113	0.0115
	34	34	34	34	34	33	34	34	34	34
SH SHUTTLE RUN	-0.14474	-0.21341	-0.12419	-0.26049	0.24311	-0.09924	-0.05450	-0.05730	-0.40259	-0.24739
	0.2419	0.1461	0.4305	0.1040	0.1304	0.5427	0.7384	0.7255	0.0100	0.1238
	40	40	40	40	40	33	40	40	40	40
PU PUSH-UPS	0.01854	0.08520	-0.05005	-0.04071	-0.15176	-0.10324	0.06566	0.02498	-0.07852	-0.02043
	0.4108	0.6061	0.7622	0.4056	0.3564	0.5734	0.6913	0.4800	0.6347	0.9018
	39	39	39	39	39	32	39	39	39	39
RL BLOCK JUMP	0.78526	0.65358	0.77092	0.64594	0.04566	0.97193	0.23226	0.14208	0.45147	0.48537
	0.0001	0.0001	0.0001	0.0001	0.7976	0.0001	0.1862	0.4228	0.0074	0.0036
	44	34	34	34	34	33	34	34	34	34
RJ REST OF THREE SUCCESSIVE BROAD JUMPS	0.43755	0.44790	0.24210	0.12201	-0.14353	0.42947	-0.04388	0.22354	0.37422	0.26418
	0.0054	0.0013	0.0712	0.0056	0.2634	0.0124	0.1908	0.1712	0.0189	0.1041
	34	39	40	34	34	33	39	34	39	39

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > .01 UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	AL	UAL	LAL	PL	ARCL	STPE	CPG	THG	ABG	HIPG
GP GRIP STRENGTH	0.66847 0.0001 40	0.51556 0.0007 40	0.65447 0.0001 40	0.56520 0.0001 40	0.15253 0.1474 40	0.68349 0.0001 33	0.45041 0.3335 40	0.32777 0.0390 40	0.51679 0.0006 40	0.59037 0.0001 40
VO VOLLEY TEST SCORE	0.36712 0.0356 33	0.40868 0.0182 33	0.26852 0.1308 33	0.40960 0.0179 33	-0.13576 0.4513 33	0.34542 0.0528 32	0.31032 0.3788 33	0.26697 0.1331 33	0.52588 0.0017 33	0.37880 0.0316 33
SE SERVE TEST SCORE	-0.04965 0.7981 29	-0.04149 0.8308 29	-0.07258 0.7083 24	0.07747 0.6877 24	0.10837 0.5758 29	-0.09161 0.6429 28	-0.05642 0.7713 29	-0.37588 0.0445 29	-0.01229 0.9896 29	-0.09782 0.6137 29
POS POSITION USUALLY PLAYED	-0.43206 0.0054 40	-0.28191 0.0780 40	-0.48132 0.0017 40	-0.31938 0.0446 40	0.05553 0.7136 40	-0.56873 0.0006 33	0.01425 0.9305 40	-0.00898 0.9561 40	-0.06317 0.6986 40	-0.13157 0.4184 40
ST STARTER OR NOT?	0.17567 0.2783 40	0.23039 0.1526 40	0.08506 0.6018 40	0.00605 0.9704 40	-0.08776 0.5902 40	0.03091 0.8648 33	0.00900 0.9561 40	0.27888 0.0814 40	0.16059 0.3222 40	0.15866 0.3282 40
LEV LEVEL OF PLAY	0.23479 0.1447 40	0.33064 0.0372 40	0.09303 0.5680 40	0.23154 0.1506 40	0.01850 0.9098 40	0.36750 0.0358 33	0.03340 0.9834 40	-0.07845 0.6304 40	0.25171 0.1172 40	0.02937 0.8572 40
EXP YEARS OF EXPERIENCE	-0.22337 0.1659 40	-0.22578 0.1613 40	-0.14124 0.3202 40	-0.08758 0.5910 40	-0.10160 0.5327 40	-0.31970 0.0697 33	-0.09231 0.5710 40	-0.14476 0.3728 40	-0.18380 0.3760 40	-0.08215 0.6143 40
VRAB SELF-EVALUATION OF VOLLEYBALL ABILITY	0.11095 0.4455 40	0.16697 0.3031 40	0.03665 0.4223 40	0.07332 0.6530 40	-0.06297 0.6995 40	0.14698 0.4144 33	0.05516 0.7353 40	0.21070 0.1919 40	0.43311 0.0052 40	0.22671 0.1595 40
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.09121 0.5757 40	0.16098 0.3210 40	0.02306 0.8877 40	0.20382 0.2071 40	-0.15074 0.3532 40	0.03924 0.8282 33	0.01852 0.9097 40	0.18533 0.2522 40	0.29968 0.0603 40	0.08658 0.5953 40
VJMP VERTICAL JUMP	0.12041 0.5045 33	0.09516 0.5984 33	0.17014 0.3438 33	0.18847 0.2935 33	-0.36378 0.0174 33	0.09783 0.5481 43	0.10127 0.5750 33	0.12857 0.4758 33	0.13971 0.4381 33	0.08196 0.6502 33
PTWD FOOT WIDTH	0.17565 0.2783 40	0.10586 0.5156 40	0.20485 0.7048 40	0.07384 0.6505 40	-0.16013 0.3216 40	0.11444 0.5115 34	0.49543 0.3312 40	0.33822 0.0328 40	0.23681 0.1412 40	0.25857 0.1072 40
XX HIGHLY SKILLED PLAYER?	-0.37510 0.0171 40	-0.37439 0.0173 40	-0.30445 0.0561 40	-0.34855 0.0275 40	0.06696 0.6414 40	-0.48694 0.0091 34	-0.20299 0.2390 40	-0.21556 0.1816 40	-0.42458 0.0063 40	-0.20727 0.1994 40
R1 UPPER ARM LENGTH/LOWER ARM LENGTH	0.41403 0.0071 40	0.19704 0.0001 40	-0.19575 0.5161 40	-0.08490 0.5812 40	0.01742 0.8187 40	0.19406 0.2742 44	0.21464 0.1435 40	0.23764 0.1348 40	0.32689 0.0395 40	0.33809 0.0329 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	AL	UAL	LAL	HL	ARCH	STRE	CFG	THG	ABG	HIPG
R2 SHOULDER DIAMETER/CHEST DIAMETER	-0.13507 0.4060 40	-0.31460 0.0080 40	0.07684 0.6375 40	-0.15966 0.3251 40	0.05144 0.7526 40	-0.02537 0.8885 33	-0.19436 0.2548 40	-0.34948 0.0271 40	-0.34007 0.0318 40	-0.31328 0.0490 40
R3 SHOULDER DIAMETER/BI ILIAC DIAMETER	-0.01844 0.4101 40	0.04417 0.7867 40	-0.08901 0.5850 40	0.04139 0.7498 40	-0.18770 0.2461 40	-0.16104 0.3706 33	0.23168 0.1503 40	0.06960 0.6646 40	-0.08890 0.5854 40	-0.01827 0.9109 40
R4 CALF GIRTH/ANKLE GIRTH	-0.07643 0.6434 39	-0.03155 0.8488 39	-0.04584 0.5615 39	-0.02787 0.8662 39	0.09136 0.5802 39	-0.21054 0.2474 32	0.65194 0.0001 39	0.25578 0.1160 39	0.14658 0.3732 39	0.32215 0.0455 39
R5 THIGH GIRTH/CALF GIRTH	-0.06788 0.6773 40	0.00738 0.9633 40	-0.11840 0.4649 40	-0.07265 0.6554 40	-0.19822 0.2202 40	-0.03137 0.8624 33	-0.23955 0.1366 40	0.71192 0.0001 40	0.30859 0.0527 40	0.23547 0.1436 40
R6 BICEPS GIRTH/FOREARM GIRTH	0.14708 0.3651 40	0.28360 0.0762 40	-0.00845 0.9587 40	0.10800 0.5071 40	-0.08877 0.5859 40	0.03392 0.8513 33	0.19549 0.2267 40	0.45203 0.0034 40	0.46534 0.0025 40	0.49077 0.0013 40
R7 HEIGHT/ARM LENGTH	-0.54088 0.0012 33	-0.64833 0.0001 33	-0.30514 0.0842 33	-0.37912 0.0246 33	-0.15897 0.3769 33	-0.24748 0.1721 32	-0.41325 0.0168 33	-0.11329 0.5302 33	-0.36646 0.0359 33	-0.50632 0.0026 33
R8 ARM SPAN/HEIGHT	0.07599 0.6743 33	0.01937 0.9148 33	0.12283 0.4973 33	0.20622 0.2496 33	-0.11360 0.5290 33	0.02021 0.4126 32	0.25553 0.1512 33	0.07952 0.6600 33	0.08841 0.6247 33	0.09063 0.6160 33
R9 HEIGHT/LEG LENGTH	-0.27347 0.1236 33	-0.31251 0.0766 33	-0.14882 0.3477 33	-0.09783 0.5881 33	-0.07715 0.6646 33	-0.23642 0.1917 32	0.06051 0.7380 33	-0.06502 0.7192 33	-0.29439 0.0963 33	-0.36843 0.0349 33
P10 HEIGHT/TRUNK	0.16536 0.3578 33	0.11785 0.5136 33	0.17255 0.3364 33	0.04303 0.8121 33	-0.07734 0.6688 33	0.14285 0.4354 32	-0.00314 0.4642 33	-0.12290 0.4456 33	0.09906 0.5834 33	0.11315 0.5307 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	0.04293 0.6070 33	0.14341 0.4254 33	0.00437 0.4587 33	-0.00559 0.4754 33	0.14381 0.4246 31	0.14146 0.4400 32	-0.14710 0.4140 33	-0.04419 0.8071 33	0.09651 0.5932 33	0.11002 0.5422 33
R12 TOT	0.27355 0.1235 33	0.28236 0.1114 33	0.19863 0.2678 33	0.09462 0.6004 33	0.01724 0.4242 31	0.23024 0.2044 32	-0.00846 0.4627 33	-0.00712 0.9696 33	0.24057 0.1775 33	0.24839 0.1036 33
R13	-0.51471 0.0022 33	-0.63168 0.0001 33	-0.31302 0.0741 33	-0.34187 0.0515 33	0.00746 0.4671 31	-0.38024 0.0318 32	-0.74827 0.0001 33	-0.49155 0.0037 33	-0.69719 0.0001 33	-0.90063 0.0001 33
R14	0.14708 0.3651 40	0.28360 0.0762 40	-0.00845 0.9587 40	0.10800 0.5071 40	-0.08877 0.5859 40	0.03392 0.8513 33	0.19549 0.2267 40	0.45203 0.0034 40	0.46534 0.0025 40	0.49077 0.0013 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1PI UNDER H0:P=0 / NUMBER OF OBSERVATIONS

	CHG	BIG	PAC	ANK	SHD	CHN	BILD	KNN	AKKD	WRD
SN	0.10369	0.24308	0.15741	0.03988	-0.04333	0.09315	-0.27146	-0.11445	0.13291	0.04063
SUBJECT NUMBER	0.5243	0.1307	0.3320	0.4045	0.7906	0.5675	0.3902	0.4814	0.4136	0.8034
	40	40	40	34	40	40	40	40	40	40
AG	-0.08654	-0.06135	-0.29456	-0.26340	-0.36407	-0.02948	-0.05061	-0.25112	-0.14511	-0.06457
AGE	0.5454	0.7069	0.0650	0.1052	0.0141	0.8567	0.7565	0.1180	0.3716	0.6922
	40	40	40	34	40	40	40	40	40	40
WT	0.81313	0.78909	0.66445	0.54971	0.84794	0.70513	0.31539	0.79026	0.63932	0.64456
WEIGHT (IN KILOGRAMS)	0.0001	0.0001	0.0001	0.0001	0.0014	0.0001	0.0474	0.0001	0.0001	0.0001
	40	40	40	34	40	40	40	40	40	40
HT	0.21407	0.13973	0.17344	0.35985	0.20507	0.16622	0.41913	0.35918	0.41506	0.55444
HEIGHT (IN CENTIMETERS)	0.2316	0.4380	0.3330	0.0431	0.2523	0.3552	0.0152	0.0401	0.0163	0.0008
	33	33	33	32	33	33	33	33	33	33
ASP	0.43265	0.33470	0.43656	0.49382	0.50435	0.41245	0.33484	0.51882	0.53308	0.63053
ARM SPAN	0.0053	0.0348	0.0044	0.0014	0.0009	0.0082	0.3347	0.0006	0.0004	0.0001
	40	40	40	34	40	40	40	40	40	40
PL	0.36879	0.28639	0.20948	0.18410	0.26543	0.30296	0.00423	0.12280	0.19266	0.03960
PLEXIBILITY	0.0209	0.0771	0.2207	0.2619	0.1024	0.0604	0.9796	0.4564	0.2400	0.8108
	34	34	34	34	34	34	39	39	34	34
TL	0.30618	0.21421	0.14133	0.41582	0.06542	0.09604	0.10729	0.26815	0.51996	0.43615
TRUNK LENGTH	0.0782	0.2238	0.3047	0.0161	0.7111	0.5888	0.5459	0.1252	0.0016	0.0099
	34	34	34	34	34	34	34	34	34	34
LL	0.20535	0.26191	0.12438	-0.00107	0.08271	0.23465	0.33359	0.27401	0.10471	0.28425
TOTAL LEG LENGTH	0.2516	0.1409	0.4404	0.9453	0.6472	0.1487	0.0578	0.1224	0.5620	0.1025
	33	33	33	32	33	33	33	33	33	33
LLL	0.23874	0.06651	0.24524	0.59483	0.34384	0.21944	0.44608	0.38156	0.42593	0.34560
LOWER LEG LENGTH	0.1179	0.6834	0.1272	0.0001	0.0298	0.1127	0.0039	0.0151	0.0061	0.0289
	40	40	40	34	40	40	40	40	40	40
ULL	0.11257	0.29992	0.3079	-0.28736	-0.07728	0.13456	0.10426	0.09475	-0.08887	0.12521
UPPER LEG LENGTH	0.5328	0.0899	0.4644	0.1108	0.6640	0.4386	0.5637	0.5999	0.5228	0.4875
	33	33	33	32	33	33	33	33	33	33
AL	0.47854	0.39343	0.34712	0.51726	0.33343	0.40500	0.33497	0.52805	0.54375	0.67446
TOTAL ARM LENGTH	0.0018	0.0130	0.0112	0.0007	0.0355	0.0045	0.3346	0.0005	0.0003	0.0001
	40	40	40	34	40	40	40	40	40	40
NAL	0.55432	0.47656	0.17446	0.47665	0.27013	0.52000	0.22247	0.57846	0.46246	0.66787
UPPER ARM LENGTH	0.0002	0.0019	0.0160	0.0022	0.0418	0.0006	0.1667	0.0001	0.0027	0.0001
	40	40	40	34	40	40	40	40	40	40
LAL	0.24714	0.22607	0.12841	0.43244	0.32373	0.19404	0.33443	0.35162	0.44115	0.50414
LOWER ARM LENGTH	0.0626	0.1107	0.0342	0.0054	0.0416	0.2205	0.0143	0.0261	0.0017	0.0009
	40	40	40	34	40	40	40	40	40	40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:P=0 / NUMBER OF OBSERVATIONS

	CHG	BIG	PPG	ANKG	SHD	CHD	RIILD	KMD	ANKD	WRD
HL HAND LENGTH	0.29788 0.0619 40	0.36234 0.0216 40	0.40657 0.0092 40	0.43816 0.0053 39	0.20484 0.2008 40	0.31151 0.0504 40	0.15015 0.3551 40	0.37827 0.0161 40	0.53497 0.0004 40	0.86536 0.0024 40
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.17832 0.2709 40	-0.06749 0.6790 40	-0.00220 0.4843 40	-0.08279 0.6163 39	-0.26095 0.1039 40	-0.25652 0.1101 40	-0.03748 0.8184 40	0.04379 0.7885 40	0.01654 0.9193 40	0.16300 0.3149 40
STRE STAND AND REACH HEIGHT	0.36519 0.0366 33	0.25198 0.1572 33	0.30875 0.0804 33	0.44477 0.0108 32	0.35848 0.0405 33	0.33486 0.0533 33	0.49480 0.0034 33	0.51416 0.0022 33	0.49015 0.0038 33	0.67289 0.0001 33
CPG CALF GIRTH	0.60418 0.0001 40	0.66297 0.0001 40	0.72767 0.0001 40	0.55420 0.0003 39	0.35663 0.0239 40	0.48190 0.0016 40	0.08948 0.5830 40	0.52510 0.0005 40	0.44229 0.0043 40	0.38159 0.0151 40
THG THIGH GIRTH	0.56575 0.0001 40	0.55309 0.0002 40	0.31554 0.0473 40	0.36732 0.0214 39	0.10836 0.5057 40	0.42345 0.0065 40	0.03918 0.3103 40	0.48934 0.0014 40	0.36360 0.0211 40	0.16101 0.3209 40
ABG ABDOMINAL GIRTH	0.69256 0.0001 40	0.58955 0.0001 40	0.36276 0.0214 40	0.33420 0.0376 39	0.40746 0.0090 40	0.66447 0.0001 40	0.48815 0.3314 40	0.62447 0.0001 40	0.43466 0.0051 40	0.35755 0.0235 40
HIPG HIP GIRTH	0.71545 0.0001 40	0.76368 0.0001 40	0.54031 0.0001 40	0.40585 0.0104 39	0.34577 0.0284 40	0.58584 0.0001 40	0.34872 0.3274 40	0.68802 0.0001 40	0.50703 0.0008 40	0.32500 0.0063 40
CHG CHEST GIRTH	1.00000 0.0000 40	0.79559 0.0001 40	0.61120 0.0001 40	0.49171 0.0015 39	0.46189 0.0027 40	0.83141 0.0001 40	0.13323 0.4125 40	0.65282 0.0001 40	0.51098 0.0008 40	0.52340 0.0005 40
BIG BICEPS GIRTH	0.74559 0.0001 40	1.00000 0.0000 40	0.64918 0.0001 40	0.31615 0.0499 39	0.24334 0.0662 40	0.51605 0.0001 40	-0.03447 0.9781 40	0.53437 0.0004 40	0.37621 0.0167 40	0.44471 0.0040 40
PPG FOREARM GIRTH	0.61120 0.0001 40	0.69918 0.0001 40	1.00000 0.0000 40	0.49842 0.0012 39	0.41401 0.0071 40	0.53760 0.0003 40	0.17323 0.2851 40	0.58237 0.0001 40	0.40452 0.0096 40	0.48317 0.0016 40
ANKG ANKLE GIRTH	0.49171 0.0015 39	0.31615 0.0499 39	0.44442 0.0012 39	1.00000 0.0000 39	0.36045 0.0242 39	0.42725 0.0057 39	0.36138 0.3238 39	0.449831 0.0012 39	0.67745 0.0001 39	0.51292 0.0008 39
SHD SHOULDER DIAMETER	0.46149 0.0027 40	0.29334 0.0062 40	0.41901 0.0071 40	0.36045 0.0242 39	1.00000 0.0000 40	0.52535 0.0005 40	0.43691 0.0092 40	0.47273 0.0021 40	0.36722 0.0198 40	0.38312 0.0147 40
CHD CHEST DIAMETER	0.43141 0.0001 40	0.61605 0.0001 40	0.53760 0.0001 40	0.42725 0.0067 39	0.52535 0.0005 40	1.00000 0.0000 40	0.13932 0.3912 40	0.65492 0.0001 40	0.51564 0.0307 40	0.55141 0.0002 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	CHG	BIG	PPG	AMKG	SHD	CHD	BILD	KND	ANKD	WRD
BILO	0.13123	-0.00447	0.17323	0.36138	0.40691	0.13932	1.00000	0.35865	0.20755	0.09972
BI-ILIAC DIAMETER	0.4125	0.9781	0.2851	0.0238	0.0092	0.3912	0.0000	0.0231	0.1988	0.5404
	40	40	40	39	40	40	40	40	40	40
KND	0.65282	0.53437	0.58237	0.49831	0.47273	0.65492	0.35865	1.00000	0.59347	0.61500
KNEE DIAMETER	0.0001	0.0004	0.0001	0.0012	0.0021	0.0001	0.0231	0.0000	0.0001	0.0001
	40	40	40	39	40	40	40	40	40	40
ANKD	0.51098	0.37621	0.40852	0.67745	0.36722	0.51564	0.23755	0.59347	1.00000	0.65156
ANKLE DIAMETER	0.0008	0.0167	0.0096	0.0001	0.0194	0.0001	0.1988	0.0001	0.0000	0.0001
	40	40	40	39	40	40	40	40	40	40
WRD	0.52340	0.44471	0.44317	0.51292	0.38312	0.55141	0.09972	0.61500	0.65156	1.00000
WRIST DIAMETER	0.0005	0.0040	0.0016	0.0008	0.0147	0.0002	0.5404	0.0001	0.0001	0.0000
	40	40	40	39	40	40	40	40	40	40
BISK	0.53322	0.55253	0.34980	0.28486	0.26385	0.46799	0.07294	0.38926	0.36856	0.14374
BICEPS SKINFOLD	0.0004	0.0002	0.0269	0.0788	0.0999	0.0023	0.5547	0.0130	0.0193	0.2644
	40	40	40	39	40	40	40	40	40	40
TRISK	0.48450	0.65211	0.41436	0.00688	0.03397	0.31767	-0.10790	0.22074	0.12263	0.07681
TRICEPS SKINFOLD	0.0015	0.0001	0.0071	0.4664	0.4352	0.0454	0.5375	0.1711	0.4509	0.6376
	40	40	40	39	40	40	40	40	40	40
SURS	0.29179	0.23404	0.01706	-0.17592	0.14193	0.35964	0.14689	0.30895	-0.02063	-0.00208
SUBSCAPULAR SKINFOLD	0.0677	0.1461	0.4168	0.2841	0.3423	0.0226	0.3658	0.0524	0.8994	0.9898
	40	40	40	39	40	40	40	40	40	40
SUPI	0.34250	0.35003	0.06261	0.06769	-0.02091	0.34435	-0.06636	0.14708	0.00465	-0.10207
SUPRA-ILIAC SKINFOLD	0.0122	0.0268	0.7011	0.6822	0.8941	0.0296	0.6841	0.3651	0.9529	0.5308
	40	40	40	39	40	40	40	40	40	40
TOSK	0.56284	0.60163	0.28890	0.05136	0.12323	0.48394	-0.00001	0.34079	0.14791	0.04516
TOTAL SKINFOLD	0.0002	0.0001	0.0706	0.7562	0.4487	0.0016	0.9999	0.0314	0.3624	0.7520
	40	40	40	39	40	40	40	40	40	40
PODP	0.54671	0.58130	0.24145	0.05425	0.13201	0.46161	0.04362	0.35419	0.14757	0.03617
PERCENTAGE BODY FAT	0.0003	0.0001	0.0785	0.7429	0.4168	0.0027	0.7493	0.0249	0.3635	0.8247
	40	40	40	39	40	40	40	40	40	40
SPJ	0.43628	0.32435	0.34238	0.43763	0.52949	0.47393	0.34375	0.46155	0.54128	0.66525
SPIKE JUMP	0.0044	0.0613	0.0475	0.0109	0.0013	0.0044	0.0465	0.0060	0.0010	0.0001
	34	34	34	33	34	34	34	34	34	34
SH	-0.34202	-0.33464	-0.26611	-0.16393	-0.44501	-0.42816	-0.10339	-0.31555	-0.23307	-0.30117
SHUTTLE RUN	0.0150	0.0348	0.0970	0.3147	0.0040	0.0058	0.5016	0.0473	0.1478	0.0590
	40	40	40	39	40	40	40	40	40	40
PU	0.01214	-0.01795	0.14047	0.15495	0.38449	0.00257	0.05133	0.02452	-0.19511	0.06327
PUSH-UPS	0.4413	0.4136	0.4424	0.4530	0.0157	0.4876	0.7563	0.4422	0.2339	0.7020
	34	39	39	38	34	49	39	34	34	39

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |PI| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	CHG	DIG	PRG	AMKG	SHD	CHD	BILD	KND	ANKD	WRD
BL BLOCK JUMP	0.46850 0.0052 34	0.31975 0.0653 34	0.37861 0.0272 34	0.45705 0.0075 33	0.43856 0.0095 34	0.44444 0.0037 34	0.40887 0.0164 34	0.53673 0.0011 34	0.57706 0.0004 34	0.71728 0.0001 34
BJ BEST OF THREE SUCCESSIVE APOD JOMPS	0.19127 0.0138 39	0.22692 0.1644 39	0.24728 0.1291 34	0.32212 0.0486 34	0.19506 0.2341 34	0.53698 0.0004 39	0.13359 0.4175 39	0.43131 0.0061 39	0.27275 0.0930 39	0.43923 0.0052 39
GP GRIP STRENGTH	0.45133 0.0035 40	0.59700 0.0001 40	0.40828 0.0089 40	0.30719 0.0571 39	0.24442 0.1245 40	0.27575 0.0450 40	0.13420 0.2423 40	0.39190 0.0124 40	0.41754 0.0073 40	0.52785 0.0005 40
VO VOLLEY TEST SCORE	0.44130 0.0037 33	0.36430 0.0371 33	0.49430 0.0035 34	0.39257 0.0234 33	0.23040 0.1971 33	0.58159 0.0004 33	0.28897 0.1029 33	0.41495 0.0163 33	0.43397 0.0116 33	0.44356 0.0097 33
SE SERVE TEST SCORE	0.02941 0.4796 29	-0.16903 0.3807 29	0.17853 0.3541 24	0.13023 0.5007 24	0.14778 0.4442 29	0.14865 0.3016 29	0.17559 0.3622 29	-0.02182 0.9105 29	0.08118 0.6755 29	0.11617 0.3606 29
POS POSITION USUALLY PLAYED	-0.11484 0.4402 40	0.01495 0.9027 40	-0.13114 0.4197 40	-0.35370 0.0272 39	-0.31671 0.0465 40	-0.16781 0.3007 40	-0.23027 0.1529 40	-0.26498 0.0944 40	-0.40685 0.0092 40	-0.34338 0.0301 40
ST STARTER OR NOT?	0.04706 0.5513 40	0.09865 0.5448 40	-0.00062 0.4970 40	0.16020 0.3300 39	0.08771 0.5904 40	0.11671 0.4733 40	0.03184 0.8454 40	0.21257 0.1879 40	0.05139 0.7528 40	0.20598 0.2023 40
LEV LEVEL OF PLAY	0.30434 0.0521 40	0.12306 0.4444 40	0.24054 0.1349 40	0.22040 0.1776 34	0.18844 0.2442 40	0.50534 0.0009 40	0.06952 0.6699 40	0.26659 0.0963 40	0.27894 0.0813 40	0.54581 0.0003 40
EXP YEARS OF EXPERIENCE	-0.20618 0.2018 40	-0.14357 0.3768 40	-0.23216 0.1444 40	-0.17018 0.3003 39	-0.24316 0.0766 40	-0.10434 0.5217 40	-0.04038 0.8046 40	-0.44268 0.0042 40	-0.25511 0.1121 40	-0.32348 0.0417 40
VBAR SELF-EVALUATION OF VOLLEYBALL ABILITY	0.24497 0.0747 40	0.19134 0.2369 40	0.12402 0.4458 40	0.06199 0.7078 34	0.20051 0.2148 40	0.31594 0.0470 40	0.31427 0.0483 40	0.22532 0.1621 40	0.26007 0.1051 40	0.27268 0.0887 40
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.31292 0.0443 40	0.31835 0.0449 40	0.09214 0.5704 40	0.16873 0.3045 39	0.07344 0.6525 40	0.29674 0.0624 40	-0.07747 0.6347 40	0.08840 0.5875 40	0.21100 0.1912 40	0.31760 0.0458 40
VJMP VERTICAL JUMP	0.27508 0.1213 33	0.23022 0.1974 33	0.22677 0.2044 43	0.23563 0.1442 42	0.45340 0.0080 31	0.34497 0.0493 33	0.03481 0.9788 33	0.15945 0.3754 33	0.35171 0.0447 33	0.32924 0.0514 33
FTWD FOOT WIDTH	0.24935 0.0604 40	0.19492 0.2185 40	0.32824 0.0387 40	0.44444 0.0013 34	0.31906 0.0444 40	0.22180 0.1490 40	0.14282 0.1793 40	0.15604 0.3363 40	0.41118 0.0084 40	0.23437 0.1455 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	CHG	BIG	PRG	ANKG	SHD	CHD	BILD	KND	ANKD	WRD
RX HIGHLY SKILLED PLAYER?	-0.3854 0.0139 40	-0.25639 0.1103 40	-0.35487 0.0246 40	-0.35313 0.0274 39	-0.43280 0.0053 40	-0.60101 0.0001 40	-0.12703 0.4347 40	-0.48133 0.0017 40	-0.49205 0.0013 40	-0.57278 0.0001 40
R1 UPPER ARM LENGTH/LOWER ARM LENGTH	0.43259 0.0053 40	0.38594 0.0139 40	0.1965 0.2168 40	0.24856 0.1270 39	0.08891 0.5853 40	0.46197 0.0027 40	-0.01381 0.9326 40	0.41586 0.0076 40	0.19536 0.2270 40	0.41478 0.0070 40
R2 SHOULDER DIAMETER/CHEST DIAMETER	-0.47834 0.0018 40	-0.39289 0.0121 40	-0.20540 0.2036 40	-0.13768 0.4033 39	0.34979 0.0269 40	-0.61128 0.0001 40	0.21759 0.1774 40	-0.26983 0.0922 40	-0.23527 0.1439 40	-0.25287 0.1154 40
R3 SHOULDER DIAMETER/BI ILIAC DIAMETER	0.29287 0.0667 40	0.27064 0.0912 40	0.20249 0.2102 40	-0.00928 0.9553 39	0.49145 0.0013 40	0.34184 0.0304 40	-0.59354 0.3301 40	0.09110 0.5761 40	0.12799 0.4312 40	0.25110 0.1181 40
R4 CALF GIRTH/ANKLE GIRTH	0.27198 0.0939 39	0.47729 0.0021 39	0.37914 0.0173 39	-0.26905 0.0977 39	0.10954 0.5068 39	0.19415 0.2266 39	-0.24320 0.1357 39	0.19406 0.2365 39	-0.07677 0.6423 39	-0.01554 0.9252 39
R5 THIGH GIRTH/CALF GIRTH	0.14106 0.3853 40	0.08108 0.6189 40	-0.24755 0.1235 40	-0.04383 0.7911 39	-0.17930 0.2683 40	0.04055 0.6213 40	-0.03907 0.8108 40	0.11695 0.4724 40	0.04687 0.7140 40	-0.13487 0.4067 40
P6 BICEPS GIRTH/FOREARM GIRTH	0.49742 0.0011 40	0.69844 0.0001 40	-0.02270 0.8894 40	-0.06150 0.7049 39	-0.00685 0.9665 40	0.32244 0.0424 40	-0.17752 0.2131 40	0.16587 0.3063 40	0.11975 0.4617 40	0.13642 0.4013 40
R7 HEIGHT/ARM LENGTH	-0.46509 0.0064 33	-0.38423 0.0273 33	-0.34278 0.0238 33	-0.29806 0.0975 32	-0.26524 0.1357 33	-0.34643 0.0222 33	-0.07298 0.6865 33	-0.39399 0.0233 33	-0.37434 0.0319 33	-0.34657 0.0482 33
P8 ARM SPAN/HEIGHT	0.14761 0.4124 33	0.09907 0.5834 33	0.38413 0.0273 33	0.18778 0.3034 32	0.44735 0.0090 33	0.18444 0.3042 33	0.00264 0.3984 33	0.15561 0.3872 33	0.09902 0.5835 33	0.08122 0.6532 33
R9 HEIGHT/LEG LENGTH	-0.04422 0.5828 33	-0.22636 0.2053 33	-0.02540 0.4844 33	0.27089 0.1337 32	0.03657 0.4399 33	-0.17014 0.4437 33	-0.14911 0.4076 33	-0.07351 0.6843 33	0.19459 0.2779 33	0.04593 0.7996 33
R10 HEIGHT/TRUNK	-0.20142 0.2594 33	-0.15511 0.3887 33	-0.06281 0.1244 33	-0.18899 0.3002 32	0.11825 0.5122 33	0.03077 0.4650 33	0.21450 0.2306 33	-0.02744 0.8794 33	-0.29565 0.0448 33	-0.04770 0.7921 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	0.04004 0.8244 33	0.29278 0.0982 33	-0.01280 0.8562 33	-0.42444 0.0140 32	-0.16457 0.3455 33	0.05514 0.7603 33	-0.07884 0.6628 33	-0.04911 0.7861 33	-0.20155 0.2607 33	0.00668 0.9706 33
R12 TOT	-0.02714 0.4407 33	0.06448 0.6944 33	-0.00621 0.4726 33	-0.23332 0.1447 32	0.04744 0.7436 33	0.14006 0.4402 33	0.13654 0.2730 33	0.05081 0.7789 33	-0.23792 0.1824 33	-0.02309 0.8485 33

CORRELATION COEFFICIENTS / PROB > 1R1 UNDER 110:PH0=0 / NUMBER OF OBSERVATIONS

[illegible]

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RTSK	TRISK	SHRS	SUPI	TOSK	RODP	SPJ	SH	PU	BL
AL TOTAL ARM LENGTH	0.04507 0.7825 40	0.03468 0.8318 40	0.06232 0.7025 40	-0.15834 0.3290 40	-0.00416 0.4553 40	0.04460 0.7847 40	0.72500 0.0001 34	-0.18434 0.2419 40	0.01854 0.9108 39	0.78526 0.0001 34
UAL UPPER ARM LENGTH	0.20577 0.2027 40	0.08892 0.5853 40	0.25044 0.1183 40	0.07611 0.6407 40	0.14581 0.2254 40	0.24227 0.1320 40	0.59457 0.0002 34	-0.21341 0.1861 40	0.08520 0.6061 39	0.65358 0.0001 34
LAL LOWER ARM LENGTH	-0.12218 0.4526 40	-0.01058 0.9484 40	-0.14250 0.3804 40	-0.35702 0.0237 40	-0.20514 0.2041 40	-0.15615 0.3354 40	0.72735 0.0001 34	-0.12819 0.4305 40	-0.05005 0.7622 39	0.77092 0.0001 34
HL HAND LENGTH	-0.07446 0.6462 40	0.05220 0.7490 40	-0.14417 0.2444 40	-0.15475 0.3404 40	-0.11116 0.4947 40	-0.10384 0.5235 40	0.64811 0.0001 34	-0.26089 0.1040 40	-0.04071 0.8056 39	0.69599 0.0001 34
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.26224 0.1020 40	0.01418 0.9308 40	0.13224 0.4160 40	-0.16020 0.3234 40	-0.08174 0.6154 40	-0.10232 0.5294 40	-0.03581 0.3406 34	0.24311 0.1306 40	-0.15176 0.3564 39	0.04566 0.7976 34
STRZ STAND AND REACH HEIGHT	-0.08454 0.6397 33	-0.12979 0.4716 33	0.00429 0.4811 33	-0.28486 0.1081 33	-0.17100 0.3414 33	-0.11361 0.5290 33	0.78578 0.0001 33	-0.09924 0.5827 33	-0.10324 0.5739 32	0.87193 0.0001 33
CPG CALP GIRTH	0.40422 0.0097 40	0.47875 0.0019 40	0.11406 0.4643 40	0.25755 0.1086 40	0.42547 0.0062 40	0.36886 0.0192 40	0.13193 0.2768 34	-0.05450 0.7384 40	0.06566 0.6913 39	0.23226 0.1862 34
TRG THIGH GIRTH	0.51537 0.0007 40	0.41322 0.0080 40	0.18440 0.2418 40	0.32877 0.0383 40	0.47639 0.0019 40	0.47200 0.0021 40	0.16978 0.3371 34	-0.05730 0.7255 40	0.02498 0.8800 39	0.14208 0.4228 34
ABG ABDOMINAL GIRTH	0.44872 0.0024 40	0.32488 0.0383 40	0.38260 0.0148 40	0.38247 0.0149 40	0.50536 0.0004 40	0.52523 0.0005 40	0.42933 0.0113 34	-0.40259 0.0100 40	-0.07852 0.6347 39	0.45147 0.0074 34
HIPG HIP GIRTH	0.44464 0.0036 40	0.54771 0.0003 40	0.44508 0.0040 40	0.28688 0.0727 40	0.57447 0.0001 40	0.59275 0.0001 40	0.42846 0.0115 34	-0.24739 0.1238 40	-0.02043 0.9018 39	0.48537 0.0036 34
CHG CHEST GIRTH	0.53322 0.0004 40	0.48450 0.0015 40	0.24174 0.0677 40	0.34250 0.0122 40	0.56284 0.0002 40	0.54671 0.0003 40	0.43628 0.0099 34	-0.38202 0.0150 40	0.01218 0.9413 39	0.46850 0.0052 34
RIG RICEPS GIRTH	0.55253 0.0002 40	0.65211 0.0001 40	0.23404 0.1441 40	0.45003 0.0268 40	0.60163 0.0001 40	0.58130 0.0001 40	0.32435 0.0613 34	-0.33464 0.0344 40	-0.01795 0.9136 39	0.31975 0.0653 34
PRG FOREARM GIRTH	0.34940 0.0264 40	0.41936 0.0071 40	0.01704 0.4164 40	0.06261 0.7011 40	0.24490 0.0706 40	0.24145 0.0785 40	0.34238 0.0475 34	-0.26611 0.0470 40	0.14087 0.3423 39	0.37961 0.0272 34

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RISK	TRISK	SURS	SUPI	TOSK	BODP	SPJ	SH	PO	BL
ANKG										
ANKLE GIRTH	0.28486 0.0788 39	0.00688 0.9669 39	-0.17542 0.2841 39	0.06769 0.6822 39	0.05136 0.7562 39	0.05425 0.7424 39	0.43763 0.0109 33	-0.16393 0.3187 39	0.15495 0.3530 38	0.45705 0.0075 33
SHD										
SHOULDER DIAMETER	0.26385 0.0999 40	0.03397 0.8352 40	0.14193 0.3823 40	-0.02091 0.8981 40	0.12323 0.4487 40	0.13201 0.4168 40	0.52969 0.0013 34	-0.44501 0.0040 40	0.38849 0.0157 39	0.43856 0.0095 34
CHD										
CHEST DIAMETER	0.46799 0.0023 40	0.31767 0.0458 40	0.35969 0.0226 40	0.34435 0.0296 40	0.48394 0.0016 40	0.46161 0.0027 40	0.47393 0.0046 34	-0.42816 0.0058 40	0.00257 0.9876 39	0.48444 0.0037 34
BILO										
BI-ILIAC DIAMETER	0.07294 0.6547 40	-0.10790 0.5075 40	0.14689 0.3658 40	-0.06636 0.6841 40	-0.00001 0.4999 40	0.04362 0.7893 40	0.34375 0.0465 34	-0.10939 0.5016 40	0.05133 0.7563 39	0.40887 0.0164 34
KND										
KNEE DIAMETER	0.38926 0.0130 40	0.22074 0.1711 40	0.30845 0.0524 40	0.14704 0.3651 40	0.34079 0.0314 40	0.35419 0.0249 40	0.46155 0.0060 34	-0.31555 0.0473 40	0.02452 0.8822 39	0.53673 0.0311 34
ANKD										
ANKLE DIAMETER	0.36856 0.0193 40	0.12263 0.4509 40	-0.12063 0.8994 40	0.00965 0.9529 40	0.14791 0.3624 40	0.14757 0.3635 40	0.54128 0.0010 34	-0.23307 0.1478 40	-0.19511 0.2339 39	0.57706 0.0004 34
WRD										
WRIST DIAMETER	0.18074 0.2644 40	0.07681 0.6376 40	-0.00204 0.4848 40	-0.10207 0.5308 40	0.04516 0.7820 40	0.03617 0.8247 40	0.66525 0.0001 34	-0.30117 0.0590 40	0.06327 0.7020 39	0.71728 0.0001 34
BTSK										
BICEPS SKINFOLD	1.00000 0.0000 40	0.63536 0.0001 40	0.14485 0.1725 40	0.51347 0.0007 40	0.74849 0.0001 40	0.74951 0.0791 40	0.01270 0.9432 34	-0.06040 0.7112 40	-0.14793 0.3688 39	-0.02791 0.8755 34
TRISK										
TRICEPS SKINFOLD	0.63536 0.0001 40	1.00000 0.0000 40	0.27031 0.0916 40	0.50402 0.0004 40	0.82407 0.0001 40	0.79762 0.0001 40	-0.19340 0.2731 34	0.04926 0.7627 40	-0.15366 0.3503 39	-0.13209 0.4565 34
SUBS										
SUBSCAPULAR SKINFOLD	0.14485 0.3725 40	0.27031 0.0916 40	1.00000 0.0000 40	0.44984 0.0036 40	0.60725 0.0001 40	0.60482 0.0001 40	-0.05364 0.7207 34	-0.03818 0.8151 40	0.02196 0.8944 39	-0.02108 0.9058 34
SUPI										
SUPRA-ILIAC SKINFOLD	0.51147 0.0007 40	0.50402 0.0009 40	0.44984 0.0036 40	1.00000 0.0000 40	0.42249 0.0001 40	0.74733 0.0001 40	-0.39360 0.0251 34	0.00710 0.9653 40	0.07719 0.6405 39	-0.33903 0.0498 34
TOSK										
TOTAL SKINFOLD	0.78849 0.0001 40	0.82407 0.0001 40	0.60725 0.0001 40	0.42249 0.0001 40	1.00000 0.0000 40	0.98201 0.0001 40	-0.22953 0.1916 34	-0.00712 0.9652 40	-0.06758 0.6827 39	-0.18732 0.2888 34
BODP										
PERCENTAGE BODY FAT	0.74451 0.0001 40	0.79762 0.0001 40	0.60482 0.0001 40	0.74733 0.0001 40	0.94201 0.0001 40	1.00000 0.0000 40	-0.14513 0.2688 34	-0.02794 0.8641 40	-0.07793 0.6172 39	-0.15335 0.3966 34

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > IRI UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RISK	TRISK	SURS	SUPI	TOSK	BODP	SPJ	SH	PU	BL
SPJ SPIKE JUMP	0.01270 0.9432 34	-0.19340 0.2731 34	-0.06364 0.7207 34	-0.38360 0.0251 34	-0.22953 0.1416 34	-0.19513 0.2688 34	1.00000 0.0000 34	-0.40540 0.0174 34	0.02389 0.8450 33	0.94962 0.0001 34
SH SHUTTLE PUN	-0.06040 0.7112 40	0.04926 0.7627 40	-0.03818 0.4151 40	0.00710 0.9653 40	-0.00712 0.4652 40	-0.02794 0.8641 40	-0.40540 0.3174 34	1.00000 0.0000 41	-0.23112 0.1569 39	-0.30202 0.0826 34
PU PUSH-UPS	-0.14793 0.3688 39	-0.15366 0.3503 39	0.02146 0.8944 39	0.07719 0.6405 39	-0.06758 0.6827 39	-0.07793 0.6372 39	0.02389 0.3950 33	-0.23112 0.1569 39	1.00000 0.0000 39	-0.08585 0.6347 33
BL BLOCK JUMP	-0.02791 0.4755 34	-0.13209 0.4565 34	-0.02108 0.9058 34	-0.33903 0.0498 34	-0.18732 0.2888 34	-0.15335 0.3866 34	0.94962 0.3001 34	-0.30202 0.0826 34	-0.08585 0.6347 33	1.00000 0.0000 34
RJ REST OF THREE SUCCESSIVE BROAD JUMPS	0.02425 0.8835 39	-0.14660 0.3732 39	-0.04745 0.7742 39	-0.12716 0.4405 39	-0.10744 0.5150 39	-0.07726 0.6402 39	0.66065 0.0001 33	-0.37786 0.0177 34	0.07935 0.6358 38	0.64580 0.0001 33
GP GRIP STRENGTH	0.07074 0.6645 40	0.14629 0.3677 40	-0.04017 0.4056 40	-0.14731 0.3644 40	0.01410 0.9312 40	0.00291 0.9455 40	0.62756 0.0001 34	-0.39192 0.0113 41	-0.05114 0.7572 39	0.63172 0.0001 34
VO VOLLEY TEST SCORE	0.21743 0.2242 33	0.06942 0.7011 33	0.11246 0.5332 33	0.05171 0.7750 33	0.13475 0.4541 33	0.13328 0.8462 33	0.33830 0.0255 33	-0.15965 0.3671 34	0.10380 0.5718 32	0.43847 0.0107 33
SE SERVE TEST SCORE	0.02271 0.9069 29	-0.04031 0.8355 29	0.16043 0.4058 29	0.07879 0.6846 29	0.06643 0.7321 29	0.02435 0.9002 24	-0.06623 0.7329 29	-0.18460 0.3288 30	0.12877 0.5056 29	-0.03306 0.8648 29
POS POSITION USUALLY PLAYED	-0.11643 0.4724 40	0.09501 0.5595 40	0.24525 0.0744 40	0.24320 0.0663 40	0.14322 0.2322 40	0.16799 0.3001 40	-0.56746 0.3005 34	-0.07122 0.6623 40	0.11560 0.8434 39	-0.55230 0.0007 34
ST STARTER OR NOT?	0.01625 0.9207 40	-0.07020 0.6669 40	0.04742 0.1714 40	-0.05362 0.7425 40	-0.02641 0.4696 40	-0.01602 0.9219 40	0.24278 0.1665 34	-0.21599 0.1807 40	0.37321 0.0193 39	0.16203 0.3599 34
LEV LEVEL OF PLAY	-0.04518 0.7819 40	-0.15656 0.3347 40	0.02460 0.8802 40	0.04940 0.7621 40	-0.04818 0.7678 40	-0.07373 0.6512 40	0.45128 0.0074 34	-0.21062 0.1920 40	0.13658 0.4071 39	0.48276 0.0038 34
EXP YEARS OF EXPERIENCE	-0.04443 0.5853 40	0.05124 0.7535 40	-0.02447 0.4596 40	0.10419 0.5024 40	0.02412 0.4826 40	0.00449 0.4585 40	-0.23992 0.1717 34	-0.00149 0.9408 40	0.02876 0.8620 39	-0.31665 0.0681 34
VARB SELF-EVALUATION OF COLLEGIATE ABILITY	0.24415 0.1372 40	0.18014 0.2660 40	0.11369 0.4444 40	0.11308 0.4472 40	0.21041 0.1914 40	0.18703 0.2477 40	0.35034 0.0422 34	-0.31650 0.0466 40	0.05809 0.7254 39	0.34848 0.0434 34

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PRCB > IPI UNDER HO:PHO=0 / NUMBER OF OBSERVATIONS

	RISK	TRISK	SUN5	SNPI	TOSK	R00P	SPJ	SH	PII	BL
GAB	0.17754	0.12727	-0.17615	0.20364	0.11541	0.10401	0.33773	-0.4095H	0.23286	0.22836
SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.2729	0.4339	0.2769	0.2078	0.4767	0.5230	0.0766	0.0087	0.1537	0.1940
	40	40	40	40	40	40	34	40	39	34
VJMP	0.15226	-0.14024	-0.17046	-0.25054	-0.15543	-0.17052	0.67614	-0.53219	0.18527	0.49045
VERTICAL JUMP	0.3976	0.4363	0.3418	0.1597	0.3465	0.3427	0.0001	0.0014	0.3100	0.0038
	33	33	33	33	33	33	33	33	32	33
FTWD	0.40056	0.15272	-0.04516	0.03938	0.15565	0.15471	0.13969	0.06104	0.00625	0.06248
FOOT WIDTH	0.0104	0.3468	0.5592	0.4093	0.3375	0.3405	0.5369	0.7083	0.9699	0.7256
	40	40	40	40	40	40	34	40	39	34
XX	-0.12882	0.12509	-0.03041	0.06484	0.02536	0.02011	-0.72220	0.36462	-0.03961	-0.65720
HIGHLY SKILLED PLAYER?	0.4242	0.4414	0.4522	0.6904	0.8766	0.4020	0.0001	0.0191	0.8108	0.0001
	40	40	40	40	40	40	34	41	39	34
R1	0.31760	0.10621	0.40206	0.33923	0.37095	0.34964	0.15813	-0.15328	0.14457	0.20768
UPPER ARM LENGTH/LOWER ARM LENGTH	0.0458	0.5142	0.0101	0.0322	0.0144	0.0124	0.3419	0.3450	0.3799	0.2386
	40	40	40	40	40	40	34	40	39	34
R2	-0.26164	-0.29161	-0.24004	-0.37206	-0.38904	-0.35868	-0.01797	0.06881	0.36137	-0.11659
SHOULDER DIAMETER/CHEST DIAMETER	0.1029	0.0679	0.1356	0.0181	0.0131	0.0230	0.3196	0.6731	0.0238	0.5114
	40	40	40	40	40	40	34	40	39	34
R3	0.16661	0.14005	0.00873	0.07330	0.12952	0.04632	0.12992	-0.29378	0.30053	-0.01323
SHOULDER DIAMETER/BI ILIAC DIAMETER	0.3042	0.3887	0.4573	0.6531	0.4257	0.5543	0.4640	0.0658	0.0630	0.9408
	40	40	40	40	40	40	34	40	39	34
R4	0.22206	0.55001	0.11743	0.29236	0.47517	0.40781	-0.19471	0.05580	-0.06540	-0.16141
CALF GIRTH/ANKLE GIRTH	0.1743	0.0003	0.0486	0.0709	0.0022	0.0100	0.2775	0.7358	0.6965	0.3695
	39	39	39	39	39	39	33	39	38	33
R5	0.24634	0.07872	0.11573	0.16577	0.19155	0.23033	0.02575	-0.01605	-0.03070	-0.03107
THIGH GIRTH/CALF GIRTH	0.1254	0.6292	0.4770	0.3067	0.2364	0.1524	0.8851	0.9217	0.8528	0.8615
	40	40	40	40	40	40	34	40	39	34
R6	0.40463	0.48760	0.32031	0.42223	0.54827	0.52457	0.03134	-0.20518	-0.17139	0.04217
BICEPS GIRTH/FOREARM GIRTH	0.0087	0.0014	0.0434	0.0066	0.0003	0.0005	0.6474	0.2041	0.2968	0.8128
	40	40	40	40	40	40	34	40	39	34
R7	-0.06134	0.02987	-0.34301	-0.20440	-0.19674	-0.25701	-0.25619	0.35486	-0.10507	-0.27078
HEIGHT/ARM LENGTH	0.7343	0.8689	0.0237	0.2527	0.2724	0.1444	0.1501	0.0427	0.5671	0.1275
	33	33	33	33	33	33	33	33	32	33
R8	0.10421	-0.06546	0.03578	0.09702	0.04571	0.04426	0.19772	-0.24867	0.22513	0.14110
ARM SPAN/HEIGHT	0.5444	0.7174	0.4433	0.5412	0.8006	0.6213	0.2700	0.1630	0.2154	0

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |P| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RISK	TRISK	SHRS	SUPI	TOSK	ROND	SPJ	SH	PU	BL
R10 HEIGHT/TRUNK	-0.16668 0.3534 33	-0.02546 0.4442 33	0.20765 0.2462 33	-0.08603 0.6341 33	-0.01634 0.4274 33	-0.00076 0.4967 33	-0.00706 0.9689 33	0.14354 0.4253 33	0.20567 0.2588 32	-0.00474 0.4571 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	0.21285 0.2343 33	0.37477 0.0316 33	0.14434 0.4425 33	0.14022 0.4364 33	0.28490 0.1081 33	0.24865 0.0914 33	-0.14691 0.4146 33	0.21257 0.2350 33	-0.08766 0.6333 32	-0.10962 0.5437 33
R12 TOT	0.05744 0.7507 33	0.15983 0.3743 33	0.12414 0.0657 33	0.10361 0.5661 33	0.20499 0.2404 33	0.25757 0.1474 33	-0.02260 0.9007 33	0.11366 0.5288 31	0.09790 0.5940 32	-0.00479 0.4789 33
R13	-0.33068 0.0602 33	-0.34669 0.0481 33	-0.52465 0.0017 33	-0.42535 0.0136 33	-0.52144 0.0014 33	-0.53497 0.0013 33	-0.42283 0.3142 33	0.37442 0.0318 33	-0.11684 0.5241 32	-0.35879 0.0072 33
R14	0.40963 0.0087 40	0.448760 0.0014 40	0.32031 0.0434 40	0.42223 0.0066 40	0.54827 0.0003 40	0.52857 0.0005 40	0.03134 0.6474 34	-0.20518 0.2041 40	-0.17139 0.2968 39	0.04217 0.4128 34
SN SUBJECT NUMBER	-0.12767 0.4386 34	-0.00924 0.9543 41	0.03057 0.4637 34	0.34392 0.0312 30	-0.00583 0.9715 40	-0.03140 0.8379 40	-0.02662 0.3705 40	0.13613 0.4023 40	0.07303 0.6543 40	0.22038 0.1718 40
A3 AGE	0.13468 0.4137 39	0.03736 0.4166 41	0.04217 0.6441 34	0.08958 0.6378 30	0.07541 0.6437 40	0.06287 0.6494 40	0.15474 0.3404 40	0.66158 0.0001 40	0.38172 0.0151 40	0.34828 0.0276 40
WT WEIGHT (IN KILOGRAMS)	0.39236 0.0135 39	0.67432 0.0001 41	0.42555 0.0121 34	-0.18368 0.3312 30	-0.24424 0.1204 40	0.18701 0.2474 40	0.16471 0.3098 40	-0.29829 0.0615 40	0.18046 0.2651 40	0.15127 0.3515 40
HT HEIGHT (IN CENTIMETRES)	0.31744 0.0767 32	0.64934 0.0001 33	0.14554 0.2413 32	-0.11844 0.5465 28	-0.48802 0.0040 33	0.04330 0.4104 31	0.24027 0.1780 33	-0.21112 0.2382 33	0.08593 0.6344 33	0.00849 0.4626 33
ASP ARM SPAN	0.43725 0.0054 34	0.65254 0.0001 40	0.34262 0.0341 33	-0.02495 0.4978 24	-0.54370 0.0001 40	0.12482 0.4465 40	0.24310 0.1307 40	-0.34190 0.0308 40	0.12408 0.4273 40	0.11718 0.4715 40
PL PLASTICITY	-0.06102 0.7159 34	0.04656 0.5587 34	0.22697 0.2040 33	0.10432 0.5402 24	0.14802 0.3685 34	0.24053 0.0728 34	-0.06885 0.5771 39	0.00742 0.4642 34	0.28022 0.0440 39	0.34156 0.0333 39
TL TRUNK LENGTH	0.20736 0.2444 33	0.43251 0.0106 34	-0.04414 0.4502 33	-0.26395 0.1665 24	-0.24344 0.1644 34	0.06015 0.7354 34	0.18176 0.3336 34	-0.43321 0.0105 34	0.06214 0.7268 34	0.23786 0.1755 34

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |r| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RJ	GP	VO	SE	POS	ST	LEV	EXP	VBAB	GAB
LL TOTAL LEG LENGTH	0.22386 0.2181 32	0.47640 0.0051 33	0.21962 0.1212 32	-0.06247 0.7522 24	-0.31525 0.0739 33	-0.04460 0.7440 33	0.16763 0.3511 33	0.07349 0.6844 33	0.05842 0.7467 33	-0.04661 0.5928 33
LLL LOWER LEG LENGTH	0.28783 0.0756 39	0.44431 0.0041 40	0.17594 0.3274 33	0.07583 0.6958 24	-0.49185 0.0013 40	0.04655 0.7755 40	0.00798 0.3610 40	-0.14630 0.3677 40	-0.01546 0.9245 40	-0.15308 0.3457 40
OLL UPPER LEG LENGTH	0.06200 0.7360 32	0.30085 0.0889 33	0.21194 0.2442 32	-0.09872 0.6172 28	-0.08544 0.6364 33	-0.06758 0.7086 33	0.11266 0.5325 33	0.15214 0.3980 33	0.05886 0.7449 33	-0.033094 0.8643 33
AL TOTAL ARM LENGTH	0.43755 0.0053 39	0.66897 0.0001 40	0.36712 0.0356 33	-0.04965 0.7981 29	-0.43206 0.0054 40	0.17567 0.2783 40	0.23479 0.1447 40	-0.22337 0.1654 40	0.11095 0.4955 40	0.09121 0.5757 40
OAL UPPER ARM LENGTH	0.49790 0.0013 39	0.51556 0.0007 40	0.40868 0.0182 33	-0.04149 0.8308 29	-0.28191 0.0780 40	0.23039 0.1526 40	0.33064 0.0372 40	-0.22578 0.1613 40	0.16697 0.3031 40	0.16098 0.3210 40
LAL LOWER ARM LENGTH	0.29210 0.0712 34	0.65447 0.0001 40	0.26852 0.1308 33	-0.07258 0.7083 29	-0.48132 0.0017 40	0.08506 0.6018 40	0.09303 0.5680 40	-0.16124 0.3202 40	0.03665 0.8223 40	0.02306 0.8877 40
HL HAND LENGTH	0.32201 0.0456 34	0.56520 0.0001 40	0.40960 0.0179 33	0.07797 0.6877 29	-0.31938 0.0446 40	0.00605 0.9704 40	0.23154 0.1506 40	-0.08758 0.5910 40	0.07332 0.6530 40	0.20382 0.2071 40
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.18353 0.2434 39	0.15253 0.3474 40	-0.13576 0.4513 33	0.10837 0.5758 29	0.05553 0.7336 40	-0.08776 0.5902 40	0.01850 0.9098 40	-0.10160 0.5327 40	-0.06297 0.6995 40	-0.15074 0.3532 40
SIRE STAND AND REACH HEIGHT	0.42947 0.0126 33	0.68349 0.0001 33	0.14542 0.0528 32	-0.09161 0.6429 28	-0.56873 0.0006 33	0.03091 0.8644 33	0.36750 0.0354 33	-0.31970 0.0697 33	0.14698 0.4144 33	0.03928 0.8282 33
CPG CALF BIRTH	-0.04388 0.7908 39	0.45041 0.0035 40	0.31032 0.0788 33	-0.05642 0.7713 29	0.01425 0.4305 40	0.00407 0.9561 40	0.03340 0.9834 40	-0.09231 0.5710 40	0.05516 0.7353 40	0.01852 0.4097 40
THG THIGH GIRTH	0.22359 0.1712 39	0.32777 0.0390 40	0.26697 0.1331 33	-0.37588 0.0445 29	-0.00898 0.4561 40	0.27884 0.0814 40	-0.07845 0.5304 40	-0.14476 0.3728 40	0.21070 0.1419 40	0.18533 0.2522 40
ABG ABDOMINAL GIRTH	0.37422 0.0184 34	0.51679 0.0006 40	0.52588 0.0017 33	-0.01229 0.9496 24	-0.06317 0.6486 40	0.16054 0.3222 40	0.25171 0.1172 40	-0.14380 0.3767 40	0.43311 0.0052 40	0.29968 0.0603 40
HIPG HIP GIRTH	0.26418 0.1041 34	0.59037 0.0001 40	0.37480 0.0316 33	-0.04782 0.6137 29	-0.13157 0.4184 40	0.15466 0.4242 40	0.02937 0.3572 40	-0.08215 0.6143 40	0.22671 0.1595 40	0.08658 0.5953 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RJ	GP	VO	SE	PDS	ST	LEV	EXP	VBAB	GAB
CHG CHEST GIRTH	0.34127 0.0138 39	0.45133 0.0035 40	0.49130 0.0037 33	0.02941 0.8796 24	-0.11444 0.4402 40	0.04706 0.5513 40	0.30934 0.3521 40	-0.20618 0.2018 40	0.28497 0.0747 40	0.31292 0.0493 40
RIG BICEPS GIRTH	0.22642 0.1648 39	0.59700 0.0001 40	0.36430 0.0371 33	-0.16903 0.3807 24	0.01945 0.4027 40	0.04865 0.5444 40	0.12306 0.4494 40	-0.14357 0.3768 40	0.19134 0.2369 40	0.31395 0.0449 40
PRG FOREARM GIRTH	0.24728 0.1291 39	0.40828 0.0089 40	0.49430 0.0035 33	0.17853 0.3541 24	-0.11114 0.4147 40	-0.00062 0.4970 40	0.24054 0.1349 40	-0.23216 0.1494 40	0.12402 0.4458 40	0.09234 0.5709 40
AMKG ANKLE GIRTH	0.32212 0.0486 38	0.30719 0.0571 39	0.34257 0.0238 13	0.13023 0.5007 24	-0.35370 0.0272 39	0.16020 0.3300 39	0.22040 0.1776 39	-0.17018 0.3003 39	0.06199 0.7078 39	0.16873 0.3045 39
SHD SHOULDER DIAMETER	0.19506 0.2341 39	0.24442 0.1285 40	0.23040 0.1971 33	0.14778 0.4442 24	-0.31671 0.0465 40	0.08771 0.5904 40	0.18844 0.2442 40	-0.28316 0.0766 40	0.20051 0.2148 40	0.07344 0.6525 40
CHD CHEST DIAMETER	0.53648 0.0004 39	0.27575 0.0850 40	0.58159 0.0704 33	0.19865 0.3016 29	-0.16781 0.3907 40	0.11671 0.4714 40	0.50534 0.0009 40	-0.10434 0.5217 40	0.31594 0.0470 40	0.29679 0.0629 40
BILD BI-ILIAC DIAMETER	0.13359 0.4175 39	0.18920 0.2423 40	0.24897 0.1029 33	0.17559 0.3622 29	-0.23027 0.1529 40	0.03184 0.8454 40	0.06952 0.5699 40	-0.04039 0.8046 40	0.31427 0.0483 40	-0.07747 0.6347 40
KND KNEE DIAMETER	0.43131 0.0061 39	0.39190 0.0124 40	0.41495 0.0163 33	-0.02182 0.9105 29	-0.26494 0.0944 40	0.21257 0.1879 40	0.26659 0.0963 40	-0.44268 0.0042 40	0.22532 0.1621 40	0.08840 0.5475 40
ANKD ANKLE DIAMETER	0.27275 0.0930 39	0.41754 0.0073 40	0.43397 0.0116 33	0.08118 0.6755 24	-0.40685 0.0042 40	0.05134 0.7528 40	0.27494 0.0813 40	-0.25511 0.1121 40	0.26007 0.1051 40	0.21100 0.1912 40
WRD WRIST DIAMETER	0.43923 0.0052 39	0.52785 0.0005 40	0.44356 0.0097 33	0.17617 0.3406 29	-0.34338 0.0301 40	0.20598 0.2024 40	0.54581 0.3003 40	-0.32348 0.0417 40	0.27268 0.0487 40	0.31760 0.0458 40
BISK BICEPS SKINFOLD	0.02425 0.4435 39	0.07074 0.6645 40	0.21743 0.2242 33	0.02271 0.4069 24	-0.11693 0.4724 40	0.01625 0.49207 40	-0.04518 0.7819 40	-0.08893 0.5853 40	0.23915 0.1372 40	0.17759 0.2729 40
TRISK TRICEPS SKINFOLD	-0.14660 0.3732 39	0.14629 0.3677 40	0.06942 0.7011 11	-0.04031 0.8355 24	0.04507 0.5545 40	-0.07020 0.6669 40	-0.15656 0.3347 40	0.05124 0.7535 40	0.18014 0.2660 40	0.12727 0.4339 40
SORS SUBSCAPULAR SKINFOLD	-0.04745 0.1742 39	-0.04017 0.8056 40	0.11246 0.5332 13	0.14043 0.4058 24	0.24525 0.0744 40	0.04742 0.7714 40	0.02460 0.3402 40	-0.02887 0.8546 40	0.11369 0.4848 40	-0.17615 0.2769 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RJ	GP	VO	SE	POS	ST	LEV	EXP	VBAB	GAB
SUPI SUPRA-ILIAC SKINFOLD	-0.12716 0.4405 39	-0.14731 0.3644 40	0.05171 0.7750 33	0.07879 0.6846 29	0.29320 0.0663 40	-0.05362 0.7425 40	0.04940 0.7621 40	0.10919 0.5024 40	0.11308 0.4872 40	0.20369 0.2074 40
TOSK TOTAL SKINFOLD	-0.10744 0.5150 39	0.01410 0.9312 40	0.13475 0.4547 33	0.06643 0.7321 29	0.19322 0.2322 40	-0.02681 0.8696 40	-0.04918 0.7678 40	0.02412 0.8826 40	0.21091 0.1914 40	0.11581 0.4767 40
BODP PERCENTAGE BODY FAT	-0.07726 0.6402 39	0.00297 0.9855 40	0.13728 0.4462 33	0.02435 0.9002 29	0.16799 0.3001 40	-0.01602 0.9219 40	-0.07373 0.6512 40	0.00849 0.9585 40	0.18708 0.2477 40	0.10401 0.5230 40
SPJ SPIKE JUMP	0.66065 0.0001 33	0.62756 0.0001 34	0.39830 0.0255 31	-0.06623 0.7329 29	0.56746 0.0005 34	0.24278 0.1665 34	0.45128 0.0074 34	-0.23992 0.1717 34	0.35034 0.0422 34	0.30773 0.0766 34
SH SHUTTLE RUN	-0.37786 0.0177 34	-0.39192 0.0113 41	-0.15465 0.3671 34	-0.18460 0.3288 30	-0.07122 0.6623 40	-0.21599 0.1807 40	-0.21062 0.1920 40	-0.00189 0.9908 40	-0.31650 0.0466 40	-0.40958 0.0087 40
PO PUSH-UPS	0.07935 0.6358 38	-0.05114 0.7572 39	0.10380 0.5718 32	0.12877 0.5056 29	0.11560 0.4834 39	0.37321 0.0193 39	0.13658 0.4071 39	0.02876 0.8620 39	0.05809 0.7254 39	0.23286 0.1537 39
RL BLOCK JUMP	0.64580 0.0001 33	0.63172 0.0001 34	0.43847 0.0197 33	-0.03306 0.8648 29	-0.55230 0.0007 34	0.16203 0.3599 34	0.48276 0.3338 34	-0.31665 0.0681 34	0.34848 0.0434 34	0.22836 0.1940 34
RJ BEST OF THREE SUCCESSIVE BROAD JUMPS	1.00000 0.0000 39	0.18653 0.2555 39	0.60163 0.0003 32	0.00297 0.9880 28	-0.32482 0.0436 39	0.37139 0.0149 39	0.53032 0.0001 39	-0.10168 0.5379 39	0.35000 0.0289 39	0.38341 0.0160 39
GP GRIP STRENGTH	0.18653 0.2555 39	1.00000 0.0000 41	0.24005 0.1087 34	-0.14215 0.4537 30	-0.15438 0.3415 40	0.15076 0.3531 40	0.05064 0.7101 40	-0.15341 0.3446 40	0.23339 0.1472 40	0.21989 0.1728 40
VO VOLLEY TEST SCORE	0.60163 0.0003 32	0.28005 0.1087 34	1.00000 0.0000 34	0.32069 0.0840 30	-0.09344 0.6050 33	0.20706 0.2476 33	0.68276 0.3301 33	-0.02201 0.9032 33	0.50452 0.0028 33	0.36193 0.0385 33
SE SERVE TEST SCORE	0.00247 0.9480 28	-0.14215 0.4537 30	0.32069 0.0840 30	1.00000 0.0000 30	-0.06335 0.7441 29	-0.30152 0.1119 29	0.32042 0.3901 29	0.17824 0.3549 29	0.27322 0.1516 29	0.09180 0.6358 29
POS POSITION USUALLY PLAYED	-0.32482 0.0436 39	-0.15438 0.3415 40	-0.04344 0.6050 31	-0.06335 0.7441 29	1.00000 0.0000 40	0.20417 0.2063 40	-0.21047 0.1924 40	0.35467 0.0247 40	0.04628 0.7768 40	0.36955 0.6698 40
ST STARTER OR NOT?	0.37139 0.0149 34	0.15076 0.3531 40	0.20706 0.2476 33	-0.10152 0.1119 24	0.20417 0.2061 40	1.00000 0.0000 40	-0.13406 0.5228 40	0.09413 0.5634 40	0.33143 0.0367 40	0.34981 0.0269 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RJ	GP	VO	SE	POS	ST	LEV	EXP	VBAB	GAB
LEV LEVEL OF PLAY	0.59032 0.0001 34	0.06064 0.7101 40	0.64276 0.0001 33	0.32042 0.0901 29	-0.21047 0.1924 40	-0.10406 0.5224 40	1.00000 0.3000 40	-0.09899 0.5434 40	0.37382 0.0175 40	0.47343 0.0020 40
EXP YEARS OF EXPERIENCE	-0.10168 0.5379 39	-0.15341 0.3446 40	-0.02201 0.4032 33	0.17824 0.3544 29	0.35467 0.0247 40	0.09413 0.5634 40	-0.09899 0.5434 40	1.00000 0.0000 40	0.21683 0.1790 40	0.18900 0.2428 40
VBAB SELF-EVALUATION OF VOLLEYBALL ABILITY	0.35000 0.0284 39	0.23339 0.1472 40	0.50452 0.0024 33	0.27322 0.1516 29	0.04628 0.7768 40	0.33143 0.0367 40	0.37382 0.0175 40	0.21683 0.1790 40	1.00000 0.0000 40	0.63007 0.0001 40
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.38341 0.0160 34	0.21489 0.1728 40	0.36193 0.0385 33	0.09180 0.6358 29	0.06955 0.6648 40	0.34981 0.0264 40	0.47343 0.0020 40	0.18900 0.2428 40	0.63007 0.0001 40	1.00000 0.0000 40
VJMP VERTICAL JUMP	0.47335 0.0054 33	0.20737 0.2469 33	0.18355 0.3146 32	0.00342 0.9862 28	-0.38198 0.0283 33	0.28657 0.1054 33	0.27943 0.1153 33	-0.02348 0.8968 33	0.35594 0.0420 33	0.44344 0.0097 33
FTWD FOOT WIDTH	-0.05453 0.7416 39	0.05913 0.7170 40	0.21111 0.2383 33	-0.01163 0.9523 29	-0.10071 0.5364 40	0.11499 0.4798 40	-0.06634 0.5842 40	0.01136 0.9445 40	-0.02613 0.8729 40	-0.03660 0.8226 40
XX HIGHLY SKILLED PLAYER?	-0.62241 0.0001 34	-0.26781 0.0905 41	-0.51440 0.0014 34	-0.01669 0.9302 30	0.27949 0.0801 40	-0.22281 0.1670 40	-0.57690 0.3301 40	0.36518 0.0205 40	-0.28071 0.0793 40	-0.39320 0.01214 40
R1 UPPER ARM LENGTH/LOWER ARM LENGTH	0.36763 0.0213 39	0.13483 0.4068 40	0.29816 0.0919 33	0.01387 0.4431 29	0.01091 0.4467 40	0.20800 0.1978 40	0.32005 0.3441 40	-0.14875 0.3596 40	0.16490 0.3092 40	0.16568 0.3069 40
R2 SHOULDER DIAMETER/CHEST DIAMETER	-0.41733 0.0042 39	-0.07350 0.6522 40	-0.40979 0.0179 33	-0.10707 0.5804 29	-0.10345 0.5232 40	-0.04868 0.7655 40	-0.33048 0.0127 40	-0.15806 0.3300 40	-0.17179 0.2892 40	-0.26617 0.0969 40
R3 SHOULDER DIAMETER/ILIAC DIAMETER	0.04722 0.7753 39	0.03474 0.8315 40	-0.07158 0.6422 33	-0.04704 0.4083 29	-0.06373 0.6461 40	0.04464 0.7445 40	0.11006 0.4490 40	-0.22713 0.1587 40	-0.12258 0.4511 40	0.14258 0.34801 40
R4 CALF GIRTH/ANKLE GIRTH	-0.33228 0.0415 38	0.22285 0.1121 39	-0.01246 0.4434 33	-0.16413 0.3449 29	0.32722 0.0420 34	-0.12946 0.4322 39	-0.14395 0.2623 39	0.04532 0.7441 39	0.03395 0.8374 39	-0.12228 0.4583 39
R5 THIGH GIRTH/CALF GIRTH	0.28301 0.0808 34	0.00274 0.9866 40	0.04282 0.4130 33	-0.34766 0.0646 29	-0.01564 0.9237 40	0.30460 0.0560 40	-0.09068 0.5779 40	-0.08006 0.6234 40	0.19570 0.2262 40	0.20028 0.2153 40
R6 BICEPS GIRTH/FOREARM GIRTH	0.07244 0.6588 39	0.43062 0.0055 40	-0.00746 0.4444 33	-0.35988 0.0552 29	0.14404 0.1114 40	0.13441 0.4013 40	-0.06771 0.5781 40	0.02872 0.8473 40	0.13895 0.3925 40	0.34419 0.0272 40

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	RJ	GP	VO	SP	POS	ST	LEV	EXP	VBAB	GAB
R7 HEIGHT/ARM LENGTH	-0.25210 0.1639 32	-0.36014 0.0395 33	-0.37695 0.0334 32	-0.12340 0.5299 24	0.02343 0.4970 33	-0.12528 0.4873 33	-0.22536 0.2073 33	0.03712 0.8375 33	-0.12202 0.4988 33	-0.06690 0.7115 33
R8 ARM SPAN/HEIGHT	0.14910 0.4154 32	0.03767 0.8351 33	0.22484 0.2160 32	0.17047 0.3858 24	-0.12578 0.4855 33	0.08836 0.6249 33	0.07516 0.6776 33	-0.18874 0.3034 33	0.12799 0.4778 33	0.02050 0.9098 33
R9 HEIGHT/LEG LENGTH	-0.05339 0.7716 32	-0.13991 0.4374 33	-0.20778 0.2538 32	-0.01532 0.9383 24	0.06766 0.7083 33	0.11636 0.5190 33	-0.02562 0.8874 33	-0.25952 0.1447 33	0.01252 0.9449 33	0.14575 0.4151 33
R10 HEIGHT/TPWR	0.02655 0.8853 32	0.01467 0.9354 33	0.21872 0.2291 32	0.22448 0.2465 24	-0.11869 0.5106 33	-0.02897 0.8728 33	0.00342 0.9849 33	0.34042 0.0526 33	-0.01739 0.9235 33	-0.29012 0.1015 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	-0.05121 0.7807 32	0.14358 0.4254 33	0.15256 0.4045 32	-0.11876 0.5472 24	0.08338 0.6446 33	-0.05569 0.7582 33	0.07853 0.6640 33	0.17367 0.3338 33	0.05965 0.7416 33	0.04601 0.7993 33
R12 TOT	0.06186 0.7366 32	0.11662 0.5181 33	0.25737 0.1550 32	0.11214 0.5694 24	-0.10420 0.5634 33	-0.06640 0.7135 33	0.04111 0.8203 33	0.31713 0.0721 33	-0.00313 0.9862 33	-0.23067 0.1965 33
R13	-0.30135 0.0437 32	-0.49429 0.0035 33	-0.33722 0.0591 32	0.16787 0.3932 24	0.02448 0.8750 33	-0.24822 0.1637 33	-0.26336 0.1386 33	0.22667 0.2046 33	-0.21935 0.2200 33	-0.17553 0.3285 33
R14	0.07249 0.6588 34	0.43062 0.0055 40	-0.07946 0.4649 33	-0.35988 0.0552 29	0.16404 0.3118 40	0.13641 0.4013 40	-0.06771 0.6781 40	0.02872 0.8603 40	0.13895 0.3925 40	0.34919 0.0272 40
SN SUBJECT NUMBER	YJMP	PTWD	XX	R1	R2	R3	R4	R5	R6	R7
AG AGE	0.15882 0.3773 33	0.02812 0.8633 40	0.10457 0.5153 41	0.03385 0.8357 40	-0.15382 0.3413 40	0.22463 0.1635 40	0.10815 0.5122 39	-0.20228 0.2107 40	0.19005 0.2402 40	-0.12479 0.4890 33
WT WEIGHT (IN KILOGRAMS)	-0.04002 0.4250 33	-0.19117 0.2373 40	0.20822 0.1914 41	-0.01871 0.9088 40	-0.31628 0.0468 40	-0.29333 0.0760 40	-0.14406 0.3816 39	0.14264 0.3749 40	0.20258 0.2100 40	0.21847 0.2219 33
HT HEIGHT (IN CENTIMETERS)	0.22712 0.2037 33	0.31988 0.0442 40	-0.44865 0.0033 41	0.40898 0.0088 40	-0.31022 0.0514 40	0.14206 0.3819 40	0.25046 0.1093 39	0.12221 0.4525 40	0.43854 0.0046 40	-0.52844 0.0016 33
	0.07744 0.6716 32	-0.04258 0.8140 33	-0.10761 0.0816 34	0.15752 0.3813 33	0.01633 0.9281 33	-0.20133 0.2612 33	-0.21880 0.2289 32	-0.08339 0.6445 33	0.00674 0.9703 33	-0.06208 0.7315 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	VJMP	FTWD	XX	P1	P2	R3	R4	R5	R6	R7
ASP ARM SPAN	0.24764 0.1646 33	0.12616 0.4379 40	-0.50534 0.0009 40	0.10652 0.5130 40	0.01002 0.9511 40	0.12754 0.4329 40	-0.03137 0.5801 39	-0.02053 0.9000 40	0.03680 0.8216 40	-0.43846 0.0107 33
PL FLEXIBILITY	0.27579 0.1265 32	0.20790 0.2041 39	-0.19382 0.2371 34	0.11363 0.4410 39	-0.09314 0.5728 39	0.23334 0.1528 34	0.16836 0.3056 39	0.17736 0.2801 39	0.18521 0.2590 39	-0.09249 0.6146 32
TL TRUNK LENGTH	0.23360 0.1907 33	0.06316 0.7227 34	-0.45518 0.0068 34	0.09056 0.6105 34	-0.04011 0.8214 34	-0.04819 0.7867 34	-0.28351 0.1099 33	0.02587 0.8845 34	0.09215 0.6042 34	0.02934 0.8712 33
LL TOTAL LEG LENGTH	-0.23124 0.2028 32	-0.17033 0.3433 33	-0.01215 0.9465 33	0.30815 0.0810 33	-0.15344 0.3938 33	-0.21885 0.2211 33	0.04004 0.3278 32	0.02667 0.8829 33	0.20328 0.2565 33	-0.24660 0.1665 33
LLL LOWER LEG LENGTH	0.22269 0.2129 33	0.29461 0.0604 40	-0.23426 0.1457 40	0.09679 0.5524 40	0.07181 0.6597 40	-0.11671 0.4733 40	-0.13488 0.4130 39	-0.03197 0.8448 40	-0.15396 0.3429 40	-0.44641 0.0092 33
ULL UPPER LEG LENGTH	-0.36484 0.0401 32	-0.26610 0.1344 33	0.15583 0.3865 33	0.24776 0.1645 33	-0.19297 0.2820 33	-0.15266 0.3964 33	0.15085 0.4099 32	0.05615 0.7563 33	0.33658 0.0555 33	-0.03237 0.8581 33
AL TOTAL ARM LENGTH	0.12041 0.5045 33	0.17565 0.2783 40	-0.37439 0.0171 40	0.41903 0.0071 40	-0.13507 0.4060 40	-0.01844 0.9101 40	-0.07643 0.6438 39	-0.06788 0.6773 40	0.14708 0.3651 40	-0.54088 0.0012 33
DAL UPPER ARM LENGTH	0.09516 0.5984 33	0.10586 0.5156 40	-0.37439 0.0173 40	0.79704 0.0001 40	-0.31460 0.0480 40	0.04417 0.7867 40	-0.03155 0.8488 39	0.00738 0.9639 40	0.28360 0.0762 40	-0.64833 0.0001 33
LAL LOWER ARM LENGTH	0.17014 0.3438 33	0.20485 0.2048 40	-0.30445 0.0561 40	-0.10575 0.5161 40	0.07684 0.6175 40	-0.08401 0.5850 40	-0.09588 0.5615 39	-0.11890 0.4649 40	-0.00845 0.9587 40	-0.30514 0.0842 33
HL HAND LENGTH	0.18447 0.2435 33	0.07389 0.6505 40	-0.34855 0.0275 40	-0.08490 0.5812 40	-0.15466 0.3251 40	0.04139 0.7444 40	-0.02787 0.3662 39	-0.07265 0.6554 40	0.10800 0.5071 40	-0.37912 0.0296 33
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.36378 0.0374 33	-0.16013 0.3236 40	0.06646 0.6814 40	0.03742 0.8187 40	0.05144 0.7526 40	-0.18770 0.2461 40	0.04136 0.5802 39	-0.19822 0.2202 40	-0.08877 0.5854 40	-0.15897 0.3769 33
SIRE STAND AND REACH HEIGHT	0.04783 0.5881 33	0.11844 0.5115 33	-0.44643 0.0041 33	0.19406 0.2742 34	-0.02537 0.8885 33	-0.16104 0.3706 33	-0.21354 0.2474 32	-0.03137 0.8624 33	0.03392 0.8513 33	-0.24748 0.1721 32
CPC CALP GIRTH	0.10127 0.5750 33	0.49543 0.0012 40	-0.20299 0.2090 40	0.21464 0.1835 40	-0.18436 0.2544 40	0.21164 0.1503 40	0.65194 0.0001 39	-0.23955 0.1366 40	0.19549 0.2267 40	-0.41325 0.0168 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	VJMP	PTWD	XX	R1	R2	R3	R4	R5	R6	R7
THG										
THIGH GIRTH	0.12857 0.4758 33	0.33822 0.0328 40	-0.21556 0.1816 40	0.23764 0.1398 40	-0.34948 0.0271 40	0.06960 0.6696 40	0.25578 0.1160 39	0.71192 0.0001 40	0.45203 0.0034 40	-0.11329 0.5302 33
ABG										
ABDOMINAL GIRTH	0.13971 0.4381 33	0.23681 0.1412 40	-0.42858 0.0063 40	0.32689 0.0395 40	-0.34007 0.0118 40	-0.08890 0.5858 40	0.14658 0.3132 39	0.30859 0.0527 40	0.46534 0.0025 40	-0.36646 0.0359 33
HIPG										
HIP GIRTH	0.08196 0.6502 33	0.25857 0.1072 40	-0.20727 0.1994 40	0.33809 0.0329 40	-0.31328 0.0490 40	-0.01827 0.9109 40	0.32215 0.0455 39	0.23547 0.1436 40	0.49077 0.0013 40	-0.50632 0.0026 33
CHG										
CHEST GIRTH	0.27508 0.1213 33	0.29935 0.0606 40	-0.38594 0.0139 40	0.43254 0.0053 40	-0.47834 0.0018 40	0.29287 0.0667 40	0.21198 0.0939 39	0.14106 0.3853 40	0.49742 0.0011 40	-0.46509 0.0064 33
BIG										
BICEPS GIRTH	0.23022 0.1974 33	0.19892 0.2185 40	-0.25634 0.1103 40	0.38594 0.0139 40	-0.39289 0.0121 40	0.27064 0.0412 40	0.47729 0.0021 39	0.08108 0.6189 40	0.69844 0.0001 40	-0.38423 0.0273 33
FRG										
FOREARM GIRTH	0.22677 0.2044 33	0.32824 0.0387 40	-0.35487 0.0246 40	0.19965 0.2168 40	-0.20540 0.2036 40	0.20249 0.2102 40	0.37914 0.0173 39	-0.24755 0.1235 40	-0.02270 0.8894 40	-0.39278 0.0238 33
AWK										
ANKLE GIRTH	0.23563 0.1942 32	0.49649 0.0013 39	-0.35313 0.0274 39	0.24856 0.1270 39	-0.13768 0.4033 39	-0.00428 0.9553 34	-0.26905 0.0977 39	-0.04383 0.7911 39	-0.06150 0.7099 39	-0.29806 0.0975 32
SHD										
SHOULDER DIAMETER	0.45390 0.0080 33	0.31906 0.0448 40	-0.43280 0.0053 40	0.08891 0.5853 40	0.34979 0.0269 40	0.49145 0.0014 40	0.10954 0.5068 39	-0.17930 0.2683 40	-0.00685 0.9665 40	-0.26529 0.1357 33
CHD										
CHEST DIAMETER	0.34497 0.0493 33	0.22180 0.1690 40	-0.60101 0.0001 40	0.45197 0.0027 40	-0.61128 0.0001 40	0.34188 0.0308 40	0.19815 0.2266 39	0.08055 0.6213 40	0.32244 0.0424 40	-0.39693 0.0222 33
RIIL										
RI-ILIAC DIAMETER	0.00481 0.9788 33	0.14282 0.3793 40	-0.12703 0.4347 40	-0.01381 0.9326 40	0.21159 0.1774 40	-0.54354 0.0071 40	-0.24320 0.1357 39	-0.03907 0.8108 40	-0.17752 0.2131 40	-0.07298 0.6865 33
KND										
KNEE DIAMETER	0.15945 0.3754 33	0.15604 0.3363 40	-0.48133 0.0017 40	0.41586 0.0076 40	-0.26483 0.0422 40	0.09110 0.5161 40	0.13406 0.2365 39	0.11695 0.4724 40	0.16587 0.3063 40	-0.39399 0.0233 33
ANKD										
ANKLE DIAMETER	0.35171 0.0447 33	0.41178 0.0084 40	-0.44205 0.0013 40	0.19536 0.2270 40	-0.23527 0.1434 40	0.12744 0.4312 40	-0.01677 0.6423 39	0.04687 0.7740 40	0.11915 0.4617 40	-0.37434 0.0319 33
WPD										
WPIST DIAMETER	0.32424 0.0614 33	0.23437 0.1455 40	-0.57278 0.0001 40	0.41478 0.0070 40	-0.25287 0.1154 40	0.25110 0.1181 40	-0.01554 0.4252 39	-0.13487 0.4067 40	0.13642 0.4013 40	-0.34657 0.0492 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |PI| UNDER H0:PI=0 / NUMBER OF OBSERVATIONS

	VJMP	FTWD	XY	P1	P2	P3	R4	R5	R6	R7
RISK BICEPS SKINFOLD	0.15226	0.40056	-0.12442	0.31760	-0.26164	0.16661	0.22206	0.24634	0.40963	-0.06139
	0.3476	0.0104	0.4242	0.0454	0.1024	0.1042	0.1743	0.1254	0.0087	0.7343
	33	40	40	40	40	40	39	40	40	33
TRISK TRICEPS SKINFOLD	-0.14024	0.15272	0.12509	0.10621	-0.29161	0.14005	0.55001	0.07872	0.48760	0.02987
	0.4363	0.3468	0.4414	0.5142	0.0679	0.3447	0.0003	0.6292	0.0014	0.8689
	33	40	40	40	40	40	39	40	40	33
SUBS SUBSCAPULAR SKINFOLD	-0.17046	-0.09516	-0.03041	0.40206	-0.24009	0.00873	0.31783	0.11573	0.32031	-0.39301
	0.3418	0.5592	0.4522	0.0101	0.1356	0.9573	0.0486	0.4770	0.0439	0.0237
	33	40	40	40	40	40	39	40	40	33
SUPI SUPRA-ILIAC SKINFOLD	-0.25053	0.03938	0.06448	0.33923	-0.37206	0.07330	0.23236	0.16577	0.42223	-0.20490
	0.1547	0.8093	0.6404	0.0322	0.0141	0.6531	0.0709	0.3067	0.0066	0.2527
	33	40	40	40	40	40	39	40	40	33
TOSK TOTAL SKINFOLD	-0.15583	0.15565	0.02536	0.37045	-0.38904	0.12952	0.47517	0.19155	0.54827	-0.19678
	0.3865	0.3375	0.8766	0.0184	0.0131	0.4257	0.0022	0.2364	0.0003	0.2724
	33	40	40	40	40	40	39	40	40	33
BODP PERCENTAGE BODY FAT	-0.17052	0.15471	0.02011	0.38964	-0.35868	0.09432	0.40781	0.23033	0.52857	-0.25701
	0.3427	0.3405	0.4020	0.0129	0.0230	0.5543	0.0100	0.1528	0.0005	0.1488
	33	40	40	40	40	40	39	40	40	33
SPJ SPIKE JUMP	0.67614	0.10969	-0.72220	0.16413	-0.01747	0.12992	-0.19471	0.02575	0.08134	-0.25619
	0.0001	0.5369	0.0001	0.3419	0.4196	0.4440	0.2775	0.8851	0.6474	0.1501
	33	34	34	34	34	34	33	34	34	33
SH SHUTTLE RUN	-0.53219	0.06104	0.36462	-0.15324	0.06841	-0.29378	0.05580	-0.01605	-0.20518	0.35486
	0.0014	0.7083	0.0191	0.3450	0.6731	0.0454	0.7358	0.9217	0.2041	0.0427
	33	40	41	40	40	40	39	40	40	33
PU PUSH-UPS	0.18527	0.00625	-0.03461	0.14457	0.36137	0.30053	-0.06540	-0.03470	-0.17139	-0.10507
	0.3100	0.4699	0.4104	0.3794	0.0244	0.0630	0.6465	0.4528	0.2968	0.5571
	32	39	39	34	34	39	38	39	39	32
RL BLOCK JUMP	0.49045	0.06248	-0.45720	0.20764	-0.11659	-0.01323	-0.16141	-0.03107	0.04217	-0.27078
	0.0034	0.7256	0.0001	0.2386	0.5114	0.4404	0.3695	0.4615	0.4128	0.1275
	33	34	34	34	34	34	33	34	34	33
RJ BEST OF THREE SUCCESSIVE BROAD JUMPS	0.47335	-0.05453	-0.42241	0.36763	-0.41733	0.04722	-0.33228	0.28301	0.07299	-0.25210
	0.0054	0.7415	0.0001	0.0213	0.0042	0.7753	0.0415	0.0404	0.6548	0.1634
	33	39	34	34	34	39	38	34	39	32
GP GRIP STRENGTH	0.20737	0.05913	-0.26781	0.13443	-0.07350	0.03474	0.22285	0.00274	0.43062	-0.36014
	0.2464	0.7170	0.0405	0.4044	0.6522	0.4315	0.1727	0.4466	0.0055	0.0395
	33	40	41	40	40	40	39	40	40	33
VO VOLLEY TEST SCORE	0.14355	0.21111	-0.41440	0.24416	-0.40974	-0.07154	-0.01286	0.04282	-0.07746	-0.37695
	0.3146	0.2143	0.0014	0.0419	0.0174	0.4422	0.1434	0.4130	0.4644	0.0334
	32	33	34	33	33	44	33	34	33	32

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	VJMP	FTWD	XX	R1	R2	R3	R4	R5	R6	R7
SE SERVE TEST SCORE	0.00342 0.9862 29	-0.01163 0.9523 29	-0.01669 0.9302 30	0.01387 0.9431 29	-0.10707 0.5804 29	-0.04709 0.8083 29	-0.16413 0.3949 29	-0.34766 0.0646 29	-0.35988 0.0552 29	-0.12390 0.5299 28
POS POSITION USUALLY PLAYED	-0.38198 0.0283 33	-0.10071 0.5364 40	0.27999 0.0801 40	0.01091 0.9467 40	-0.10395 0.5232 40	-0.06373 0.6961 40	0.32722 0.3420 39	-0.01564 0.9237 40	0.16404 0.3118 40	0.02343 0.8970 33
ST STARTER OR NOT?	0.28657 0.1059 33	0.11499 0.4798 40	-0.22281 0.1670 40	0.20800 0.1978 40	-0.04868 0.7655 40	0.04464 0.7845 40	-0.12946 0.4322 39	0.30860 0.0560 40	0.13641 0.4013 40	-0.12528 0.4873 33
LEV LEVEL OF PLAY	0.27943 0.1153 33	-0.06634 0.6842 40	-0.57690 0.7001 40	0.32005 0.0441 40	-0.39048 0.0127 40	0.11006 0.4990 40	-0.18395 0.2623 39	-0.09068 0.5779 40	-0.06771 0.6781 40	-0.22536 0.2073 33
EXP YEARS OF EXPERIENCE	-0.02348 0.8968 33	0.01136 0.9445 40	0.36518 0.0205 40	-0.14875 0.3596 40	-0.15806 0.3300 40	-0.22713 0.1587 40	0.04532 0.7841 39	-0.08006 0.6234 40	0.02872 0.8603 40	0.03712 0.8375 33
VRAB SELF-EVALUATION OF VOLLEYBALL ABILITY	0.35594 0.0420 33	-0.02613 0.8729 40	-0.28071 0.0743 40	0.16490 0.3092 40	-0.17179 0.2892 40	-0.12258 0.4511 40	0.03395 0.8374 39	0.19570 0.2262 40	0.13895 0.3925 40	-0.12202 0.4988 33
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.44344 0.0097 33	-0.03660 0.8226 40	-0.39320 0.0121 40	0.16568 0.3069 40	-0.26617 0.0969 40	0.14258 0.3401 40	-0.12228 0.4583 39	0.20028 0.2153 40	0.34919 0.0272 40	-0.06690 0.7115 33
VJMP VERTICAL JUMP	1.00000 0.0000 33	0.12572 0.4857 33	-0.65427 0.0001 43	-0.01460 0.9357 33	0.04255 0.8141 33	0.38507 0.0264 33	-0.09307 0.6124 32	0.05659 0.7544 33	0.07690 0.6706 33	-0.09739 0.5959 32
FTWD FOOT WIDTH	0.12572 0.4857 33	1.00000 0.0000 40	-0.09739 0.5899 40	-0.02062 0.8495 40	0.04936 0.7623 40	0.13910 0.3920 40	0.11767 0.4756 39	-0.03131 0.8479 40	-0.05665 0.7284 40	-0.18402 0.3053 33
XX HIGHLY SKILLED PLAYER?	-0.65427 0.0001 33	-0.09739 0.5499 40	1.00000 0.0000 41	-0.21555 0.1816 40	0.26255 0.1017 40	-0.26083 0.1040 40	0.09419 0.5684 39	-0.07584 0.6419 40	-0.00919 0.9551 40	0.27066 0.1276 33
R1 UPPER ARM LENGTH/LOWER ARM LENGTH	-0.01460 0.9357 33	-0.02062 0.8495 40	-0.21555 0.1816 40	1.00000 0.0000 40	-0.41423 0.0079 40	0.11862 0.4449 40	0.03007 0.8558 39	0.09009 0.5804 40	0.33221 0.0362 40	-0.55792 0.0007 33
R2 SHOULDER DIAMETER/CHEST DIAMETER	0.04255 0.8141 33	0.04936 0.7623 40	0.26255 0.1017 40	-0.41423 0.0079 40	1.00000 0.0000 40	0.04451 0.5471 40	-0.03591 0.5614 39	-0.24893 0.1214 40	-0.34081 0.0314 40	0.18072 0.3142 33
R3 SHOULDER DIAMETER/BI ILLIAC DIAMETER	0.18507 0.0264 33	0.13910 0.3923 40	-0.26084 0.1040 40	0.11862 0.4449 40	0.04451 0.5471 40	1.00000 0.0000 40	0.33193 0.0340 39	-0.11024 0.4981 40	0.17558 0.2785 40	-0.17481 0.3306 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |PI| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	VJMP	FTWD	XX	R1	R2	R3	R4	R5	R6	R7
R4 CALF GIRTH/ANKLE GIRTH	-0.09307 0.6124 32	0.11767 0.4756 39	0.09419 0.5684 39	0.03007 0.8554 19	-0.04591 0.5614 39	0.33193 0.0340 39	1.00000 0.0000 39	-0.23116 0.1568 39	0.29725 0.0661 39	-0.25030 0.1671 32
R5 THIGH GIRTH/CALF GIRTH	0.05659 0.7544 33	-0.03131 0.8479 40	-0.07584 0.6419 40	0.04004 0.5804 40	-0.24493 0.1214 40	-0.11024 0.4983 40	-0.23116 0.1568 39	1.00000 0.0000 40	0.35776 0.0234 40	0.20104 0.2519 33
R6 BICEPS GIRTH/FOREARM GIRTH	0.07690 0.6706 33	-0.05665 0.7284 40	-0.00919 0.4551 40	0.33221 0.0362 40	-0.34081 0.0314 40	0.17554 0.2785 40	0.29725 0.0661 39	0.35776 0.0234 40	1.00000 0.0000 40	-0.10789 0.5501 33
R7 HEIGHT/APM LENGTH	-0.09739 0.5959 32	-0.18402 0.3053 33	0.27066 0.1276 33	-0.55792 0.0007 33	0.18072 0.3142 33	-0.17481 0.3306 33	-0.25030 0.1671 32	0.20104 0.2619 33	-0.10789 0.5501 33	1.00000 0.0000 33
R8 ARM SPAN/HEIGHT	0.25845 0.1532 32	0.19143 0.2859 33	-0.29605 0.0944 33	-0.06350 0.7255 33	0.14223 0.2838 33	0.37891 0.0297 33	0.19912 0.2746 32	-0.12125 0.5015 33	-0.23635 0.1854 33	-0.59706 0.0002 33
R9 HEIGHT/LEG LENGTH	0.37324 0.0354 32	0.19434 0.2785 33	-0.23417 0.1896 33	-0.25307 0.1553 33	0.19340 0.2809 33	0.15227 0.3976 33	-0.16880 0.3557 32	-0.10491 0.5612 33	-0.25414 0.1535 33	0.26759 0.1322 33
R10 HEIGHT/TRUNK	-0.20016 0.2720 32	-0.10319 0.5677 33	0.24810 0.1040 33	0.02452 0.8922 33	0.07746 0.6683 33	-0.08492 0.6187 33	0.14803 0.4188 32	-0.11885 0.5100 33	-0.12927 0.4734 33	-0.08507 0.6378 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	-0.38749 0.0282 32	-0.28511 0.1078 33	0.23571 0.1467 33	0.16133 0.3648 33	-0.18806 0.2946 33	-0.07086 0.6951 33	0.13384 0.2878 32	0.06649 0.7131 33	0.38666 0.0262 33	0.13975 0.4379 33
R12 TOT	-0.31263 0.0815 32	-0.17045 0.3429 33	0.26000 0.1439 33	0.19943 0.2658 33	-0.09016 0.6178 33	-0.12715 0.4407 33	0.19829 0.3021 32	-0.00490 0.9784 33	0.09242 0.6090 33	-0.21892 0.2210 33
R13	-0.22897 0.2075 32	-0.20196 0.2597 33	0.51096 0.0024 33	-0.52706 0.0016 33	0.29088 0.1011 33	-0.15644 0.3831 33	-0.39932 0.3236 32	0.07525 0.6773 33	-0.32646 0.0637 33	0.62944 0.0001 33
R14	0.07690 0.6706 33	-0.05665 0.7284 40	-0.00919 0.4551 40	0.33221 0.0362 40	-0.34081 0.0314 40	0.17554 0.2785 40	0.29725 0.0661 39	0.35776 0.0234 40	1.00000 0.0001 40	-0.10789 0.5501 33
SM SUBJECT NUMBER	0.07434 0.6644 33	0.25034 0.1600 33	-0.20352 0.2560 11	-0.16510 0.1545 11	-0.26423 0.1373 33	0.02804 0.4767 11	0.13005 0.2402 40			

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H₀:RHO=0 / NUMBER OF OBSERVATIONS

	RH	RY	P10	P11	P12	P13	R14
AGE							
	-0.44464	-0.31571	0.14358	0.47727	0.27194	0.34871	0.20258
	0.0095	0.0735	0.3065	0.0050	0.1257	0.0254	0.2100
	33	33	33	33	33	33	40
WT							
	0.17043	-0.17060	-0.01141	0.00611	0.12440	-0.01840	0.43854
	0.3430	0.3425	0.9494	0.4731	0.4484	0.0001	0.0046
	33	33	33	33	33	33	40
HT							
	-0.25335	-0.16914	0.15243	0.18544	0.20057	-0.24814	0.00674
	0.1549	0.3467	0.3471	0.3015	0.2631	0.1638	0.3703
	33	33	33	33	33	33	33
ASP							
	0.39407	-0.16632	0.17242	-0.05974	0.20491	-0.46697	0.03680
	0.0233	0.3549	0.3373	0.7411	0.2526	0.0062	0.8216
	33	33	33	33	33	33	40
PL							
	0.12018	0.10890	-0.25269	0.00927	-0.17929	-0.20433	0.19521
	0.5124	0.5530	0.1624	0.9598	0.3262	0.2620	0.2590
	32	32	32	32	32	32	39
TL							
	-0.21434	0.41850	-0.70051	-0.13796	-0.54214	-0.24334	0.09215
	0.2200	0.0154	0.0001	0.4439	0.0003	0.1723	0.6042
	33	33	33	33	33	33	34
LL							
	-0.13095	-0.83395	0.56083	0.66159	0.79176	-0.23431	0.20328
	0.4676	0.0001	0.0007	0.0001	0.0001	0.1844	0.2565
	33	33	33	33	33	33	33
LLL							
	0.28124	-0.03663	0.26048	-0.46402	0.16960	-0.40884	-0.15396
	0.1124	0.8396	0.1432	0.0065	0.3454	0.0181	0.3429
	33	33	33	33	33	33	40
ULL							
	-0.28399	-0.86484	0.46342	0.93715	0.75362	-0.02968	0.33658
	0.1092	0.0001	0.0065	0.0001	0.0001	0.8694	0.0555
	33	33	33	33	33	33	33
AL							
	0.07544	-0.27347	0.16536	0.04293	0.27355	-0.51471	0.14708
	0.6743	0.1236	0.3574	0.6070	0.1235	0.0022	0.3651
	34	33	33	33	33	33	40
UAL							
	0.01437	-0.31251	0.11785	0.14341	0.28236	-0.63164	0.28360
	0.4144	0.0766	0.5136	0.4259	0.1114	0.0001	0.0762
	33	33	33	33	33	33	40
LAL							
	0.12243	-0.16882	0.17255	0.00437	0.14463	-0.31302	-0.00845
	0.4473	0.3477	0.3364	0.9587	0.2574	0.0761	0.9587
	33	33	33	33	33	33	40
HL							
	0.20622	-0.09783	0.04303	-0.00554	0.04462	-0.34187	0.10800
	0.2444	0.5881	0.4121	0.9754	0.6004	0.0515	0.5071
	34	33	33	33	33	33	40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > 1% UNDER H0:PRO=0 / NUMBER OF OBSERVATIONS

	R8	P9	P10	R11	R12	R13	R14
ARCH LONGITUDINAL ARCH LENGTH (IN DEGREES)	-0.11360 0.5290 33	-0.07715 0.6696 33	-0.07734 0.5688 33	0.14381 0.4246 34	0.01724 0.4242 33	0.00746 0.4671 33	-0.08877 0.5859 40
STRE STAND AND REACH HEIGHT	0.02021 0.4126 32	-0.23692 0.1917 32	0.14285 0.4354 32	0.14146 0.4400 32	0.23024 0.2049 32	-0.38029 0.0318 32	0.03392 0.3513 33
CPG CALP GIRTH	0.25553 0.1512 33	0.06051 0.7380 33	-0.00814 0.4642 33	-0.14710 0.4140 33	-0.00846 0.9627 33	-0.74827 0.0001 33	0.19549 0.2267 40
THG THIGH GIRTH	0.07952 0.6600 33	-0.06502 0.7192 33	-0.12290 0.4956 33	-0.04419 0.8071 33	-0.00712 0.9686 33	-0.44155 0.0037 33	0.45203 0.0034 40
ABG ABDOMINAL GIRTH	0.08841 0.6247 33	-0.29439 0.0963 33	0.09906 0.5814 34	0.09651 0.5432 33	0.24057 0.1775 33	-0.69719 0.0001 33	0.46534 0.0025 40
HIPG HIP GIRTH	0.04063 0.6160 33	-0.36843 0.0349 33	0.11315 0.5307 33	0.11002 0.5422 33	0.28839 0.1036 33	-0.80063 0.0001 33	0.49077 0.0013 40
CHG CHEST GIRTH	0.14761 0.4124 33	-0.09922 0.5828 33	-0.20192 0.2598 33	0.04008 0.8248 33	-0.02718 0.8407 33	-0.80998 0.0001 33	0.49742 0.0011 40
BIG BICEPS GIRTH	0.04907 0.5834 33	-0.22636 0.2053 33	-0.15511 0.4887 33	0.29278 0.0982 33	0.06498 0.6498 33	-0.76215 0.0001 33	0.69844 0.0001 40
PRG FOREARM GIRTH	0.38413 0.0273 33	-0.02540 0.8884 33	-0.06281 0.7284 33	-0.03280 0.8562 33	-0.00621 0.9726 33	-0.64440 0.0001 33	-0.02270 0.8894 40
ANKG ANKLE GIRTH	0.18778 0.3034 32	0.27089 0.1337 32	-0.18899 0.3002 32	-0.42998 0.0140 32	-0.23332 0.1987 32	-0.51506 0.0026 32	-0.06150 0.7099 39
SHD SHOULDER DIAMETER	0.44735 0.0090 33	0.03657 0.8399 33	0.11825 0.5122 33	-0.16957 0.3455 33	0.04734 0.7436 33	-0.45462 0.0074 33	-0.00685 0.3665 40
CHD CHEST DIAMETER	0.18444 0.3042 33	-0.17018 0.3437 33	0.03077 0.4650 33	0.05519 0.7603 33	0.13906 0.4402 33	-0.44065 0.0001 33	0.32244 0.0424 40
RIIL PI-ILIAC DIAMETER	0.00264 0.4444 33	-0.14911 0.4276 33	0.21450 0.2706 33	-0.07884 0.6628 33	0.14654 0.2710 33	-0.27634 0.1144 33	-0.17752 0.2731 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |P| UNDER H0:PHO=0 / NUMBER OF OBSERVATIONS

	R8	P9	R10	P11	P12	R13	R14
KND KNEE DIAMETER	0.15561 0.3812 33	-0.07351 0.6443 33	-0.02748 0.8744 33	-0.04911 0.7861 33	0.05081 0.7789 33	-0.72188 0.0001 33	0.15587 0.3063 40
ANKD ANKLE DIAMETER	0.09902 0.5835 33	0.19459 0.2779 33	-0.23565 0.0948 33	-0.20155 0.2607 33	-0.23792 0.1824 33	-0.48052 0.0047 33	0.11975 0.4617 40
WRD WRIST DIAMETER	0.08122 0.6532 33	0.04593 0.7996 33	-0.08770 0.7921 33	0.00668 0.9706 33	-0.02309 0.8985 33	-0.49760 0.0032 33	0.13642 0.4013 40
RISK RICEPS SKINFOLD	0.10821 0.5489 33	-0.24123 0.1162 33	-0.16668 0.3539 33	0.21285 0.2343 33	0.05748 0.7507 33	-0.33068 0.0602 33	0.40363 0.0087 40
TRISK TRICEPS SKINFOLD	-0.06546 0.7174 33	-0.30339 0.0861 33	-0.02546 0.8882 33	0.37477 0.0316 33	0.15983 0.3743 33	-0.34669 0.0481 33	0.48760 0.3014 40
SUBS SUBSCAPULAR SKINFOLD	0.03578 0.8433 33	0.35621 0.0419 33	0.20765 0.2462 33	0.13838 0.4425 33	0.32418 0.0657 33	-0.52465 0.0017 33	0.32031 0.3439 40
SUPI SUPRA-ILIAC SKINFOLD	0.04702 0.5912 33	-0.24776 0.1645 33	-0.08603 0.6341 33	0.14022 0.4364 33	0.10361 0.5661 33	-0.42535 0.0136 33	0.42223 0.0066 40
TOSK TOTAL SKINFOLD	0.04571 0.8006 33	-0.36889 0.0346 33	-0.01638 0.9279 33	0.28490 0.1081 33	0.20499 0.2408 33	-0.52149 0.0014 33	0.54827 0.0003 40
BODP PERCENTAGE BODY FAT	0.08926 0.6213 33	-0.44373 0.0097 33	-0.00076 0.9467 33	0.24865 0.0914 33	0.25757 0.1479 33	-0.53447 0.0013 33	0.52857 0.3005 40
SPJ SPIKE JUMP	0.19772 0.2700 33	0.06568 0.7165 33	-0.00706 0.9689 33	-0.14641 0.4146 33	-0.02260 0.4007 33	-0.42283 0.0142 33	0.08134 0.5474 34
SH SHUTTLE RUN	-0.24863 0.1630 33	-0.06655 0.7129 33	0.14354 0.4253 33	0.21257 0.2350 33	0.11366 0.5284 33	0.37442 0.0314 33	-0.20518 0.2041 40
PN PUSH-UPS	0.22513 0.2154 32	0.03048 0.8685 32	0.20567 0.2544 32	-0.08766 0.6333 32	0.04740 0.5440 32	-0.11684 0.5241 32	-0.17139 0.2368 39
RL BLOCK JUMP	0.14110 0.4335 33	0.03422 0.8509 33	-0.00474 0.4571 33	-0.10462 0.5437 33	-0.00479 0.0784 33	-0.45844 0.0072 33	0.04217 0.3128 34

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	P8	P9	P10	P11	P12	P13	P14
RJ BEST OF THREE SUCCESSIVE BROAD JUMPS	0.14910 0.4154 32	-0.05339 0.7716 32	0.72655 0.4453 32	-0.05121 0.7807 32	0.06186 0.7366 32	-0.30135 0.0937 32	0.07299 0.6588 39
GP GRIP STRENGTH	0.03767 0.8351 33	-0.13991 0.4374 33	0.01467 0.4354 33	0.14358 0.4254 33	0.11662 0.5141 33	-0.49829 0.0035 33	0.43062 0.3055 40
VO VOLLEY TEST SCORE	0.22484 0.2160 32	-0.20778 0.2538 32	0.21872 0.2291 32	0.15256 0.4045 32	0.25737 0.1550 32	-0.33722 0.0591 32	-0.00796 0.3649 33
SE SERVE TEST SCORE	0.17047 0.3858 28	-0.01532 0.9383 28	0.22644 0.2465 28	-0.11876 0.5472 28	0.11214 0.5699 28	0.16787 0.3432 28	-0.35988 0.0552 29
POS POSITION USUALLY PLAYED	-0.12578 0.4455 33	0.06766 0.7083 33	-0.11869 0.5106 33	0.08334 0.6446 33	-0.10420 0.5639 33	0.02848 0.8750 33	0.16404 0.3118 40
ST STARTER OR NOT?	0.04436 0.6249 33	0.11636 0.5190 33	-0.02897 0.4728 33	-0.05569 0.7582 33	-0.06640 0.7135 33	-0.24822 0.1637 33	0.13641 0.4013 40
LEV LEVEL OF PLAY	0.07516 0.6776 33	-0.02562 0.8874 33	0.00382 0.4844 33	0.07853 0.6640 33	0.04111 0.8203 33	-0.26336 0.1386 33	-0.06771 0.5781 40
EXP YEARS OF EXPERIENCE	-0.18474 0.3034 33	-0.25952 0.1447 33	0.14042 0.0526 33	0.17367 0.3338 33	0.31713 0.0721 33	0.22467 0.2046 33	0.02872 0.9603 40
VBAB SELF-EVALUATION OF VOLLEYBALL ABILITY	0.12749 0.4778 33	0.01252 0.9449 33	-0.01739 0.4235 33	0.05465 0.7416 33	-0.00313 0.4862 33	-0.21435 0.2200 33	0.13495 0.3925 40
GAB SELF-EVALUATION OF GENERAL ATHLETIC ABL	0.02050 0.9094 33	0.14675 0.4151 33	-0.24012 0.1015 33	0.04601 0.7993 33	-0.23067 0.1965 33	-0.17553 0.3285 33	0.34919 0.0272 40
VJMP VERTICAL JUMP	0.25845 0.1532 32	0.37324 0.0354 32	-0.20016 0.2720 32	-0.38744 0.0242 32	-0.31263 0.0415 32	-0.22897 0.2075 32	0.07690 0.6706 33
FTWD FOOT WIDTH	0.19143 0.2454 33	0.19434 0.2785 33	-0.10319 0.5677 33	-0.28511 0.1074 33	-0.17045 0.3424 33	-0.20196 0.2597 33	-0.05665 0.7284 40
XI HIGHLY SKILLED PLAYER?	-0.24605 0.0444 43	-0.23417 0.1836 33	0.24410 0.1040 33	0.23571 0.1447 33	0.24000 0.1439 33	0.51046 0.0024 33	-0.03319 0.4551 40

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |P| UNDER H0:RHO=0 / NUMBER OF OBSERVATIONS

	RH	P9	P10	R11	P12	P13	R14
R1 UPPER ARM LENGTH/LOWER ARM LENGTH	-0.06350 0.7255 33	-0.25307 0.1553 33	0.02452 0.4422 33	0.16133 0.3694 33	0.19443 0.2654 33	-0.52706 0.0016 33	0.33221 0.3362 40
R2 SHOULDER DIAMETER/CHEST DIAMETER	0.19223 0.2838 33	0.19340 0.2809 33	0.07746 0.4643 33	-0.18806 0.2946 33	0.09016 0.6174 33	0.29044 0.1011 33	-0.34081 0.0314 40
R3 SHOULDER DIAMETER/HI ILIAC DIAMETER	0.37441 0.0297 33	0.15227 0.3476 33	-0.04442 0.4187 33	-0.07046 0.6451 33	-0.12715 0.4407 33	-0.15694 0.3431 33	0.17558 0.2785 40
R4 CALF GIRTH/ANKLE GIRTH	0.19912 0.2746 32	-0.16880 0.3557 32	0.14803 0.4184 32	0.19384 0.2874 32	0.18824 0.3021 32	-0.34432 0.0216 32	0.29725 0.0661 39
R5 THIGH GIRTH/CALF GIRTH	-0.12125 0.5015 33	-0.10491 0.5612 33	-0.11845 0.5100 33	0.06644 0.7131 33	-0.00440 0.9784 33	0.07525 0.6713 33	0.35776 0.0234 40
R6 BICEPS GIRTH/FOREARM GIRTH	-0.23635 0.1854 33	-0.25414 0.1535 33	-0.12427 0.4734 33	0.34666 0.0262 33	0.04242 0.6040 33	-0.32446 0.0637 33	1.00000 0.0001 40
R7 HEIGHT/ARM LENGTH	-0.59706 0.0002 33	0.26759 0.1322 33	-0.04507 0.6374 33	0.13975 0.4379 33	-0.21892 0.2210 33	0.62444 0.0001 33	-0.10789 0.5501 33
R8 ARM SPAN/HEIGHT	1.00000 0.0000 33	-0.01507 0.9337 33	0.04667 0.7465 33	-0.36184 0.0385 33	0.02844 0.8744 33	-0.36440 0.0341 33	-0.23635 0.1854 33
R9 HEIGHT/LEG LENGTH	-0.01507 0.4337 33	1.00000 0.0000 33	-0.63481 0.0001 33	-0.74076 0.0001 33	-0.91185 0.0001 33	0.10464 0.5622 33	-0.25414 0.1535 33
R10 HEIGHT/TRUNK	0.04667 0.7465 33	-0.63481 0.0001 33	1.00000 0.0000 33	0.31251 0.0766 33	0.84434 0.0001 33	0.04235 0.6487 33	-0.12927 0.4734 33
R11 UPPER LEG LENGTH/LOWER LEG LENGTH	-0.36184 0.0385 33	-0.74076 0.0001 33	0.31251 0.0766 33	1.00000 0.0000 33	0.54864 0.0002 33	0.12434 0.4406 33	0.38666 0.0262 33
R12 TOT	0.02844 0.4744 33	-0.91185 0.0001 33	0.84434 0.0001 33	0.59864 0.0002 33	1.00000 0.0000 33	-0.04453 0.8054 33	0.09242 0.5090 33
R13	-0.36440 0.0341 33	0.10464 0.5622 33	0.04235 0.6487 33	0.12434 0.4406 33	-0.04453 0.8054 33	1.00000 0.0000 33	-0.32646 0.0637 33

CORRELATION COEFFICIENTS

CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:PHO=0 / NUMBER OF OBSERVATIONS

	R8	R9	R10	R11	R12	R13	R14
-0.23635	-0.25414	-0.12927	0.38666	0.09242	-0.32646	1.00000	
0.1854	0.1535	0.4734	0.0262	0.6090	0.0637	0.0000	
33	33	33	33	33	33	33	40

APPENDIX E
INDIVIDUAL MEANS

CORRELATION COEFFICIENTS

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
SN	41	20.47560976	12.01766992	860.00000000	1.00000000	41.00000000
AG	41	14.70731707	2.08858647	878.00000000	17.00000000	24.00000000
WT	41	66.50243402	7.51879272	2726.60000000	53.60000000	88.20000000
HT	33	173.84848485	6.08338522	5737.00000000	161.00000000	185.00000000
ASP	40	174.90000000	6.80045247	6996.00000000	161.00000000	187.00000000
PL	39	16.33076923	8.28493046	636.90000000	0.20000000	29.40000000
TL	34	41.50294118	4.33208504	3111.10000000	74.00000000	99.50000000
LL	33	82.16060606	5.55343021	2711.30000000	70.50000000	97.50000000
LLL	40	47.82500000	2.61786270	1913.00000000	41.00000000	52.00000000
ULL	33	34.68181818	5.23631875	1144.50000000	20.50000000	51.50000000
AL	40	75.53250000	3.07990905	3021.30000000	69.00000000	82.00000000
OAL	40	24.70000000	1.85941816	1188.00000000	26.00000000	34.50000000
LAL	40	45.83750000	1.71489515	1833.50000000	42.00000000	50.00000000
HL	40	14.15000000	1.22055053	726.00000000	13.00000000	20.00000000
ARCH	40	46.44250000	11.59320507	1858.50000000	15.00000000	59.00000000
STRE	33	222.24242424	8.37418020	7334.00000000	205.00000000	236.00000000
CPG	40	36.31750000	2.09307614	1452.70000000	31.90000000	42.00000000
THG	40	58.80000000	4.76724934	2352.00000000	34.80000000	71.10000000
ABG	40	41.45750000	5.54473127	3338.30000000	73.90000000	97.90000000
HIPG	40	44.09500000	4.33423758	3963.40000000	90.70000000	109.50000000
CHG	40	90.14500000	4.60384176	3605.80000000	81.90000000	101.50000000
BIG	40	24.34500000	1.90921517	1175.40000000	25.10000000	34.70000000
PRG	40	24.01500000	1.18636444	1040.60000000	23.50000000	28.90000000
AMRG	34	25.00000000	1.14753741	475.00000000	22.60000000	27.70000000
SHD	40	37.24000000	1.91946261	1441.20000000	31.20000000	41.60000000
CHD	40	24.70000000	1.64550677	1044.00000000	24.00000000	30.20000000

CORRELATION COEFFICIENTS

VARIABLE	N	MEAN	STD DEV	SUM	MINIMUM	MAXIMUM
BUILD	40	24.08500000	1.60056881	1123.40000000	25.30000000	32.20000000
KND	40	8.85750000	0.57507525	354.30000000	7.80000000	10.30000000
ANKD	40	6.52500000	0.35930845	261.00000000	6.00000000	7.30000000
WRD	40	5.19250000	0.31735081	207.70000000	4.50000000	5.90000000
BISK	40	7.35000000	2.27314309	294.00000000	4.40000000	13.90000000
TRISK	40	15.35250000	3.19326113	614.10000000	10.60000000	24.30000000
SUBS	40	11.68500000	2.50748111	467.40000000	8.00000000	19.00000000
SUPI	40	9.40000000	2.81014645	376.00000000	5.00000000	19.00000000
TOSK	40	43.78750000	8.16727287	1751.50000000	28.60000000	68.60000000
RNDP	40	24.22000000	2.58240595	968.80000000	13.30000000	33.10000000
SPJ	34	276.58823529	11.67259844	9404.00000000	254.00000000	299.00000000
SH	41	14.50000000	0.52392748	594.50000000	13.20000000	15.60000000
PT	39	22.53846154	7.87015065	879.00000000	9.00000000	41.00000000
RL	34	262.88235294	10.40036336	8938.00000000	240.00000000	280.00000000
BJ	39	644.87179487	48.91462998	25150.00000000	556.00000000	751.00000000
GP	41	39.14634146	5.36917580	1605.00000000	27.00000000	49.00000000
VO	34	43.05842353	3.96913223	1464.00000000	33.00000000	49.00000000
SE	30	23.13333333	5.19106217	694.00000000	13.00000000	33.00000000
POS	40	4.40000000	1.73648624	174.00000000	2.00000000	7.00000000
ST	40	4.37500000	0.86787391	175.00000000	2.00000000	5.00000000
LEV	40	5.42500000	1.81005024	217.00000000	2.00000000	9.00000000
EXP	40	5.77500000	2.31480741	231.00000000	2.00000000	13.00000000
VRAB	40	7.01250000	1.05300242	280.50000000	4.00000000	9.00000000
GAB	40	7.45250000	0.47656841	298.50000000	5.00000000	9.00000000
VJMP	33	51.84949494	7.69918581	1778.50000000	40.00000000	75.00000000
PTWD	40	9.60250000	0.60700505	344.10000000	8.50000000	11.00000000
XX	41	1.64247643	0.47111640	64.00000000	1.00000000	2.00000000

APPENDIX F
VARIABLE CODE NAMES

VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM
SN	SUBJECT NUMBER	41	20.476	12.018	1.000	41.000	1.871	860.000
AG	AGE	41	19.101	2.084	17.000	28.000	0.326	808.000
WT	WEIGHT (IN KILOGRAMS)	41	66.502	7.519	53.600	83.200	1.174	2726.600
HT	HEIGHT (IN CENTIMETRES)	33	173.848	6.083	161.000	185.000	1.059	5737.300
ASP	ARM SPAN	40	174.900	6.800	161.000	187.000	1.075	5996.000
PL	PLEXIBILITY	39	16.331	8.285	0.200	29.400	1.321	636.900
TL	TRUNK LENGTH	34	91.503	4.332	79.000	99.500	0.743	3111.100
LL	TOTAL LFG LENGTH	33	82.161	5.553	70.500	97.500	0.967	2711.300
LLL	LOWER LEG LENGTH	40	47.825	2.618	41.000	52.000	0.414	1913.000
ULL	UPPER LEG LENGTH	33	34.682	5.236	20.500	51.500	0.912	1184.500
AL	TOTAL ARM LENGTH	40	75.532	3.080	69.000	82.000	0.487	3021.300
UAL	UPPER ARM LENGTH	40	29.700	1.859	26.000	34.500	0.294	1198.000
LAL	LOWER ARM LENGTH	40	45.837	1.715	42.000	50.000	0.271	1833.500
HL	HAND LENGTH	40	18.150	1.221	13.000	20.000	0.193	726.000
ARCH	LONGITUDINAL ARCH LENGTH (IN DEGREES)	40	46.462	11.593	15.000	68.000	1.833	1858.500
STBE	STAND AND REACH HEIGHT	33	222.242	8.374	205.000	236.000	1.458	7334.000
CPG	CALF GIRTH	40	36.317	2.093	31.900	42.000	0.331	1452.700
THG	THIGH GIRTH	40	58.800	4.767	39.800	71.100	0.754	2352.000
ABG	ABDOMINAL GIRTH	40	83.457	5.545	73.900	97.900	0.877	3338.300
HIPG	HIP GIRTH	40	99.095	4.334	90.700	109.500	0.685	3963.800
CHG	CHEST GIRTH	40	90.145	4.604	81.900	101.500	0.728	3605.800
BIG	BICEPS GIRTH	40	29.395	1.909	26.100	34.700	0.302	1175.800
PRG	FOREARM GIRTH	40	26.015	1.146	23.500	28.900	0.188	1040.600
ANKG	ANKLE GIRTH	39	25.000	1.148	22.600	27.700	0.184	975.000
SHD	SHOULDER DIAMETER	40	37.280	1.920	31.200	41.600	0.304	1491.200
CHD	CHEST DIAMETER	40	26.700	1.646	24.000	30.200	0.260	1058.000
BILD	BI-ILIAC DIAMETER	40	28.085	1.601	25.300	32.200	0.253	1123.400
KND	KNEE DIAMETER	40	8.857	0.575	7.800	10.300	0.091	354.300
ANKD	ANKLE DIAMETER	40	6.525	0.359	6.000	7.300	0.057	251.000
WRD	WRIST DIAMETER	40	5.192	0.317	4.500	5.900	0.050	207.700
BISK	BICEPS SKINFOLD	40	7.350	2.273	4.400	13.800	0.359	294.000
TRISK	TRICEPS SKINFOLD	40	15.352	3.193	10.600	24.300	0.505	614.100
SUBS	SUBSCAPULAR SKINFOLD	40	11.685	2.507	8.000	19.000	0.396	467.400
SUPI	SUPRA-ILIAC SKINFOLD	40	9.400	2.810	5.000	19.000	0.444	376.000
TOSK	TOTAL SKINFOLD	40	43.787	8.164	28.600	68.600	1.292	1751.500
BODP	PERCENTAGE BODY FAT	40	24.220	2.582	18.300	30.100	0.408	968.800
SPJ	SPIKE JUMP	34	276.588	11.673	254.000	299.000	2.002	9404.000
SH	SHUTTLE RUN	41	14.500	0.524	13.200	15.600	0.082	594.500
PU	PUSH-UPS	39	22.534	7.870	9.000	41.000	1.260	879.000
BL	BLOCK JUMP	34	262.892	10.400	240.000	290.000	1.784	8938.000
BJ	BEST OF THREE SUCCESSIVE BROAD JUMPS	39	644.872	48.915	556.000	751.000	7.833	25150.000
GP	GRIP STRENGTH	41	39.146	5.369	27.000	49.000	0.839	1605.000
VO	VOLLEY TEST SCORE	34	43.059	3.969	33.000	49.000	0.681	1464.000
SE	SERVE TEST SCORE	30	23.133	5.191	13.000	33.000	0.948	694.000
POS	POSITION USUALLY PLAYED	40	4.400	1.736	2.000	7.000	0.275	176.000
ST	STARTER OR NOT?	40	4.375	0.868	2.000	5.000	0.137	175.000
LEV	LEVEL OF PLAY	40	5.425	1.810	2.000	8.000	0.286	217.000
EXP	YEARS OF EXPERIENCE	40	5.775	2.315	2.000	13.000	0.366	231.000
VBAB	SELF-EVALUATION OF VOLLEYBALL ABILITY	40	7.012	1.053	4.000	9.500	0.166	280.500
GAB	SELF-EVALUATION OF GENERAL ATHLETIC ABL	40	7.462	0.977	5.000	9.000	0.154	298.500
VJMP	VERTICAL JUMP	33	53.894	7.699	40.000	75.000	1.340	1778.500
PTWD	FOOT WIDTH	40	9.602	0.607	8.500	11.000	0.096	334.100
XX	HIGHLY SKILLED PLAYER?	41	1.683	0.471	1.000	2.000	0.074	69.000

S T A T I S T I C A L A N A L Y S I S S Y S T E M

41	LAL=LOWER ARM LENGTH	15	P1=UAL/LAL;
42	HL=HAND LENGTH	16	P2=SHD/CHD;
43	APCH=LONGITUDINAL ARCH LENGTH (IN DEGREES)	17	P3=SHD/BIIL;
44	STRE=STAND AND REACH HEIGHT	18	P4=CPG/ANKG;
45	CPG=CALF GIRTH	19	P5=THG/CPG;
46	THG=THIGH GIRTH	20	P6=THG/PPG;
47	ABG=ABDOMINAL GIRTH	21	P7=HT/AL;
48	HIPG=HIP GIRTH	22	P8=ASP/HT;
49	CHG=CHEST GIRTH	23	P9=HT/LL;
50	BIG=BICEPS GIRTH	24	R10=HT/TL;
51	PRG=POPPARM GIRTH	25	R11=ULL/LL;
52	ANKG=ANKLE GIRTH	26	R12=LL/TL;
53	SHD=SHOULDER DIAMETER	27	P13=HT/WT;
54	CHD=CHEST DIAMETER	28	R14=BIG/PPG;
55	RIILD=RI-ILIAC DIAMETER	29	LABEL, SN=SUBJECT NUMBER
56	KND=KNEE DIAMETER	30	AGE
57	ANKD=ANKLE DIAMETER	31	WT=WEIGHT (IN KILOGRAMS)
58	WRD=WRIST DIAMETER	32	HT=HEIGHT (IN CENTIMETRES)
59	BISK=BICEPS SKINFOLD	33	ASP=ARM SPAN
60	TRISK=TRICEPS SKINFOLD	34	PL=FOOT LENGTH
61	SUBS=SUBSCAPULAR SKINFOLD	35	TL=TRUNK LENGTH
62	SUPI=SUPRA-ILIAC SKINFOLD	36	LL=TOTAL LEG LENGTH
63	TOSK=TOTAL SKINFOLD	37	LLL=LOWER LEG LENGTH
64	RODP=PERCENTAGE BODY FAT	38	ULL=UPPER LEG LENGTH
65	SPJ=SPIKE JUMP	39	AL=TOTAL ARM LENGTH
66	SH=SHUTTLE RUN	40	UAL=UPPER ARM LENGTH
67	PO=POUSH-UPS		
68	BL=BLOCK JUMP		
69	PL=FLEXIBILITY		
70	BJ=BEST OF THREE SUCCESSIVE BROAD JUMPS		
71	GP=GRIP STRENGTH		
72	VO=VOLLEY TEST SCORE		
73	SE=SERVE TEST SCORE		
74	POS=POSITION USUALLY PLAYED		
75	ST=STARTER OR NOT?		
76	LEV=LEVEL OF PLAY		
77	EXP=YEARS OF EXPERIENCE		
78	VBAB=SELF-EVALUATION OF VOLLEYBALL ABILITY		
79	GAB=SELF-EVALUATION OF GENERAL ATHLETIC ABL		
80	R10=HEIGHT/TRUNK		
81	R11=UPPER LEG LENGTH/LOWER LEG LENGTH		
82	R12=TOE		
83	VJTP=VERTICAL JUMP		
84	R1=UPPER ARM LENGTH/LOWER ARM LENGTH		
85	R2=SHOULDER DIAMETER/CHEST DIAMETER		
86	R3=SHOULDER DIAMETER/RI ILIAC DIAMETER		
87	R4=CALF GIRTH/ANKLE GIRTH		
88	R5=THIGH GIRTH/CALF GIRTH		
89	R6=BICEPS GIRTH/POPPARM GIRTH		
90	R7=HEIGHT/ARM LENGTH		
91	PH=ARM SPAN/HEIGHT		
92	EQ=HEIGHT/LEG LENGTH		
93	XX=HIGHLY SKILLED PLAYER?		
94	PTWD=FOOT WIDTH;		
95	IF XX=1 THEN XX=2;		

VALUE SIS 1=RIGHT BACK POSITION
 2=RIGHT FRONT POSITION
 3=CENTRE FRONT
 4=LEFT FRONT POSITION
 5=LEFT BACK POSITION
 6=CENTRE BACK POSITION
 7=SETTER;

VALUE S2S 1=PLAY 0-20%
 2=PLAY 20-40%
 3=PLAY 40-60%
 4=PLAY 60-80%
 5=PLAY 80-100%;

VALUE SIS 1=JUNIOR
 2=SENIOR HIGH
 3=A CLUB
 4=JUNIOR
 5=JUNIOR A CLUB
 6=UNIVERSITY
 7=JUNIOR NATIONAL
 8=SENIOR NATIONAL;

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VARIABLE	LABEL	N	MEAN	STANDARD DEVIATION	MINIMUM VALUE	MAXIMUM VALUE	STD ERROR OF MEAN	SUM
P1	UPPER ARM LENGTH/LOWER ARM LENGTH	40	0.644	0.035	0.574	0.726	0.005	25.923
P2	SHOULDER DIAMETER/CHEST DIAMETER	40	1.399	0.074	1.243	1.556	0.013	55.965
P3	SHOULDER DIAMETER/RI ILIAC DIAMETER	40	1.330	0.040	1.188	1.498	0.013	53.201
P4	CALF GIRTH/ANKLE GIRTH	39	1.455	0.073	1.356	1.656	0.012	56.754
P5	THIGH GIRTH/CALF GIRTH	40	1.621	0.114	1.382	1.792	0.018	64.824
P6	BICEPS GIRTH/FOREARM GIRTH	43	1.130	0.052	1.008	1.233	0.008	45.199
P7	HEIGHT/ARM LENGTH	33	2.305	0.044	2.226	2.441	0.008	76.373
P8	ARM SPAN/HEIGHT	33	1.008	0.024	0.970	1.055	0.004	33.266
P9	HEIGHT/LEG LENGTH	33	2.122	0.110	1.847	2.525	0.019	70.026
P10	HEIGHT/TRUNK	33	1.902	0.078	1.779	2.172	0.013	62.781
P11	UPPER LEG LENGTH/LOWER LEG LENGTH	33	0.731	0.123	0.410	1.120	0.021	24.204
P12	TOT	33	0.790	0.074	0.723	1.049	0.013	29.698
P13		33	2.663	0.226	2.184	3.153	0.039	87.895
P14		40	1.110	0.052	1.008	1.233	0.008	45.199

SELF-EVALUATION OF VOLLEYBALL ABILITY

VRAH	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	1	1	2.500	2.500
4	1	2	5.000	7.500
5	3	5	7.500	15.000
5.5	4	9	10.000	25.000
6	8	17	20.000	45.000
6.5	12	29	30.000	75.000
7	25	54	62.500	137.500
7.5	30	84	75.000	212.500
8	37	121	87.500	300.000
8.5	39	160	92.500	462.500
9.5	40	200	100.000	662.500

SELF-EVALUATION OF GENERAL ATHLETIC ABL

GAB	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	1	1	2.500	2.500
5	1	2	5.000	7.500
6	4	6	10.000	17.500
6.5	3	9	7.500	25.000
7	11	20	25.000	50.000
7.5	2	22	5.000	55.000
8	12	34	30.000	85.000
8.5	2	36	5.000	90.000
9	5	41	12.500	102.500

POSITION USUALLY PLAYED

POS	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
RIGHT FRONT POSIT	1	1	7.500	7.500
CENTRE FRONT	3	4	30.000	37.500
LEFT FRONT POSIT	13	17	32.500	70.000
LEFT BACK POSITI	1	18	2.500	72.500
SETTER	11	29	27.500	100.000

LEVEL OF PLAY

LEV	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
SENIOR HIGH	1	1	17.500	17.500
JUNIOR	7	8	5.000	22.500
DOUBLE AA CLUB	2	10	10.000	32.500
UNIVERSITY	4	14	40.000	72.500
JUNIOR NATIONAL	16	30	22.500	95.000
SENIOR NATIONAL	9	39	5.000	100.000

YEARS OF EXPERIENCE

EXP	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
1	1	1	5.000	5.000
2	2	3	7.500	12.500
3	5	8	20.000	32.500
4	13	21	17.500	50.000
5	7	28	15.000	65.000
6	6	34	17.500	82.500
7	7	41	10.000	92.500
8	4	45	2.500	95.000
10	1	46	2.500	97.500
11	1	47	2.500	100.000
14	1	48	2.500	102.500

STARTER OR NOT?

ST	FREQUENCY	CUM FREQ	PERCENT	CUM PERCENT
PLAY 20-40%	1	1	5.000	5.000
PLAY 40-60%	2	3	10.000	15.000
PLAY 60-80%	4	7	27.500	42.500
PLAY 80-100%	11	18	57.500	100.000

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